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PRESIDENT'S WELCOME

RACHEL POPELKA-FILCOFF

Although I have been President of the Society for Archaeological Sciences since 2016, I wanted to write a more formal welcome in 2017. There have been several changes over the year since I have been President and we look forward to more exciting changes and new initiatives in the coming years. I also wish to thank you, the membership, for your commitment to our Society, our vibrant interdisciplinary field and for continually developing and promoting archaeological science.

For those of you who do not know me personally, I am an Associate Professor of Chemistry at Flinders University in Adelaide, Australia. Originally from the USA, I have developed my career through the analysis of many classes of objects from ceramic, metal and glass, and pigments. One of my major research areas is the analysis of cultural mineral pigments (ochre and others). My lab uses several analytical techniques, with a focus on spectroscopic and radioanalytical techniques. I look forward to meeting many more of you in upcoming conferences and workshops and learning about your novel research and learning about your ideas for the Society.

We have had many new exciting changes to the Executive Board and new initiatives. There will be articles forthcoming on these, but for now I will highlight some of our recent Executive Board changes. Marcos Martinon-Torres is our recently appointed President-Elect. We welcome Andrew Zipkin to the role of Vice President of Social Media, and Tatsuya Murakami in the role of Vice President of Membership. Kyle Freund has taken on the role of General Secretary, with many thanks to Rob Sternberg for all of his years in this role. Thomas Fenn has taken on the role of Editor of the Bulletin, with thanks to Vanessa Muros for her time in the role. Marc Walton also transitioned roles to the SAS Editor, *Archaeometry*. I am the SAS Editor for the *Journal of Archaeological Sciences*. Please feel free to contact the appropriate Board member with your queries and ideas.

We also continue to strengthen relationships with international societies such as the ISA (International Society for Archaeometry), GMPCA (Le Groupe des Méthodes Pluridisciplinaires Contribuant à l'Archéologie) and the ARCAS (Australian Research Cluster for Archaeological Science) and SAA (Society for American Archaeology).

During my presidency, I am working on a renewed focus on early career researchers, and look forward to the membership's support of ECRs, as well as continuing our long-standing support for student researchers. We look

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forward to your input on this and other Society initiatives. I appreciate member perspectives and input; please contact me by email (rachel.popelkafilcoff@flinders.edu.au) with your ideas!

Rachel Popelka-Filcoff
SAS President

ANNOUNCEMENTS

Welcome to our new SAS General Secretary

Greetings from sunny Florida! I'll begin by thanking everyone for their support for me in my new role as SAS General Secretary. I'm very excited about this opportunity and I want to express my sincere appreciation for the help of Rob Sternberg in this transitional period. Rob has been SAS General Secretary since 2002, and his contribution to the organization is immeasurable. Although I'm certain he will still be involved in SAS affairs, I'd like to wish him all the best in his retirement.

For those who don't know me, I am currently an Assistant Professor of Anthropology at Indian River State College (Florida) whose specializations include lithic analysis, archaeometallurgy, spatial statistics, and field survey. I have been involved in multiple field projects throughout Italy, Greece, Turkey, Canada, and the United States, although my primary research centers on the use of archaeometric techniques to study early farming communities of the Central Mediterranean. I completed my PhD at McMaster University in 2014 with Dr. Tristan Carter and my Master's degree at the University of South Florida working with the past SAS President Dr. Robert Tykot.

I look forward to working with all of you in the upcoming years. Have a great summer!

Kyle Freund
SAS General Secretary

ARCHAEOLOGICAL CHEMISTRY
Ruth Ann Armitage, Associate Editor

Unfortunately, this column has been woefully absent from most of the past several *SAS Bulletins* due to your Associate Editor having to do too many other jobs at once. I have tried – or at least planned – to focus on the chemistry literature to highlight contributions outside of *Journal of Archaeological Sciences* and *Archaeometry* (as well as *STAR* and other journals well known to the SAS membership). Frankly, this seldom amounts to much, particularly if one focuses specifically on archaeological materials and not museum or conservation science. Relevant sessions at the American Chemical Society meetings are few and far between, with the next archaeological chemistry symposium coming up in 2019 in Orlando, Florida. See the call for papers below.

We chemists often tout our discipline as "the central science." Certainly chemistry is central to a great deal of research in archaeological science, having a role in everything from analysis of ceramics, metals, residues and even ancient DNA and dating methods. In that case, many of the columns in the *Bulletin* are, in a way, archaeological chemistry. What, then, is left? What exactly belongs here?

Those questions are for the next Associate Editor of Archaeological Chemistry to consider. This short column is my last in that capacity. The reality is that this is a job for someone who can actively engage with the literature on an ongoing basis in a way that I cannot, no matter how many Google Scholar alerts I set up. If any readers are interested in the position, please contact the *Bulletin* Editor to volunteer your time. Thank you for reading.

Call for Papers

The Division of the History of Chemistry (HIST) is planning a symposium on archaeological chemistry to be held at the spring meeting of the American Chemical Society in Orlando, FL, March 31-April 4, 2019. The tentative title of the symposium is "Archaeological Chemistry: Art and Archaeology in the Ancient and Medieval World." Papers on any subject that address this general topic, especially those that integrate chemistry with archaeology, those directed at answering social, political, and economic questions about ancient cultures, and those that incorporate the use of new technologies, are welcome. Please communicate your interest in participating in the symposium along with a tentative paper title and possible co-authors to either of the co-organizers: Seth Rasmussen (Seth.Rasmussen@ndsu.edu) or Mary Virginia Orna (maryvirginiaorna@gmail.com).

BIOARCHAEOLOGY
Rebecca Gibson, Associate Editor

Hello readers and welcome back to the bioarchaeology section of the SAS newsletter! I have recently accepted a one year position at the University of New Hampshire, so in addition to my regular email of

rgibson.archaeo@gmail.com, or my Facebook author page, http://facebook.com/TheCorsetedSkeleton, you can now also reach me at rebecca.gibson@unh.edu!

Conference News

AAA acceptance emails were sent out the week of July 10, so keep watch for more information from them around the first of August, and get busy writing your conference papers, for a strong bioarchaeology showing! This year's conference theme is "Anthropology Matters" and the keynote speakers will be Paul Farmer and Jim Yong Kim, co-founders of Partners In Health.

New Studies

University of Pennsylvania's Patrick McGovern has a new book out on the subject of the cross species phenomenon of alcohol intoxication. A logical culmination of his biomolecular archaeology project, the book "Ancient Brews: Rediscovered and Recreated" highlights the development of alcohol as a purposefully created intoxicant across the ancient world, and includes recipes, anecdotes, and experimental archaeology. He addresses early agriculture, storage practices, and legal codes regulating alcohol sales. A perfect summer read for any archaeologist.

Continuing the intoxication trend, recent research at the 2017 Psychedelic Science conference re-examined Terence McKenna's "Stoned Ape" hypothesis, a theory that psychedelic substances, particularly psilocybin or "magic mushrooms" contributed to the increased size and scope of the hominid brain. While this theory was much dismissed during McKenna's life, it is experiencing a resurgence due to the recent experimentation with minute amounts of psychotropic substances as treatment for certain psychiatric conditions, such as post-traumatic stress disorder (PTSD), obsessive/compulsive disorder (OCD), and various anxiety disorders. The expanded "Stoned Ape" hypothesis looks not only at the size and capacity of the human brain, but at the origins of our conscious thought. However, critics point out that the theory is still very speculative, and there is no archaeological evidence that hominids or early humans knew about or consumed psychoactive substances.

In additional mental health related news, a study from the Psychiatric Genomics Consortium indicates that PTSD can be identified genetically, through such techniques as telomere analysis, and that the predisposition for the condition may be heritable. This will have significant indications for reexamination of skeletal assemblages known (or not known) to have high instances of population wide trauma.

A new study by Maxime Pelletier, et al., details how natural bioturbation needs to be taken into account when one assesses faunal remains among grave assemblages. Having found rabbit bones among the Neanderthal burials at Regourdou (Montignac-sur-Vézère, Dordogne), the original hypothesis was that this showed subsistence patterns/intentional interment of rabbits with the Neanderthal dead. However, radiocarbon dating calls this analysis into question as the rabbits date to considerably later than the formerly identified Mousterian period. Furthermore, evidence suggests that the bioturbation of the rabbit warren influenced the distribution of the Neanderthal remains, leading to the need for new analysis of the entire site.

And speaking of reanalysis, the remains of people from Rapa Nui, Chile, colloquially known as Easter Island, show that they did not die out because of lack of resources due to wasteful practices, or slash/burn/strip practices. Carl Lipo (Binghampton University) and his team used molecular collagen analysis to identify food sources, and showed that about half of the Islander's diets came from marine sources, a much larger quantity than would have been possible were the ecocide idea accurate. Lipo emphasizes that this reevaluation is necessary to combat earlier work which was based on white/western centered notions of the inferiority of indigenous peoples and lifestyles.

As science advances, so too must the preconceived notions we bring into our work—therefore it is quite relevant to discuss the baby recently born in Canada who is the first (modern) child to officially have no gender marker assigned at birth. Searyl Atly Doti's health identification card is marked with a U, which will remain until the child chooses otherwise (or remain indefinitely if they do not). Putting aside for the moment that there are presumably modern societies that do not have government issued identification cards, or that have cards that do not contain gender markers, this formal recognition by a large government of the social construct of gender does impact the bioarchaeology of the future. We do skeletal identifications based on female and male sex markers, but necessarily need to take into account the lived experience of the individual when discussing their context, whether skeletal or social. We assign gender to grave goods, discuss social roles, and identify people based on skeletal sex markers which are often conflated with gender presentation. With gender reassignment/affirmation surgeries and hormonal treatments on the rise, we must be certain to strike the correct balance between reading the archaeological record, and respecting what the person experienced during their life.

A new item that might contribute to our ability to do so is the urging of the united body of United States surgeons-general to end the practice of assigning a binary gender to people born intersex. Generally, ambiguous genitals are recrafted by surgeons into either a penis or vulva, to match what gender the baby is assigned. This creates myriad problems later in life, including lack of sexual pleasure or ability to orgasm, conflicted emotions about the individual's inability to consent to a procedure performed when they were hours old, feelings of gender dysphoria if the individual feels that the wrong choice was made, and alienation of affection toward the parents who made the choice. While the policy has not yet been reversed, this is a step toward doing so, which will in turn contribute to reversing the erasure of intersex individuals from the bioarchaeological record.

One study about diet shows promise for impactful further research. The study, by Lee Berger, indicates that Homo naledi ate a diet that was high in foods with hard or rough components, such as nuts and seeds, or foods with gritty exteriors such as roots and tubers. Using both micro- and macroscopic analysis, Berger and his team identified significantly more pits and chips on the H. naledi specimens' teeth than would be seen if their diet was more moderate in terms of hard foods. Furthermore, in comparing the teeth with other hominids from the area, Berger found that the patterns of pitting were easily distinguishable, and indicated an entirely different diet. This could show anything from territoriality to individual preference, and Berger has indicated that further research is both needed, and ongoing.

Two innovations in biological science have implications for future bioarchaeological impacts—one potentially very good, one demonstrably bad. The first, the development of a new type of bioderived super strong cartilage may change the way we see arthritis in the bioarchaeological record. Biomedical engineer Kyriacos Athanasiou of UC Davis has created stretched cartilage which tests out at six times as strong as the tissue from which it was made. With successful implementation, this could change the face of various arthritic skeletal pathologies, making identification of age at death considerably more challenging, but easing the lives of many.

In contrast to that benefit, new research has brought to light the problems inherent in human consumption of placenta material. This practice, which has experienced an upswing among new mothers in recent years, has several different manifestations. Various companies have sprung up to offer to prepare the placenta for ingestion, variously cooking it, turning it into smoothies, or freeze drying it to then powder and put in gelatin capsules. While the consumption of the placenta is common among certain animals, most notably primates such as marmosets (see Julienne Rutherford's, University of Illinois Chicago, excellent work on the topic), it is contraindicated in humans. A recent case of recurrent strep was seen in a human child whose mother was taking pills made from her own placenta. Doctors determined that the mother's tissue contained the strep bacteria, which she was re-ingesting in the pills, and passing to the child via her breast milk. Knowledge of this transmission vector may spur further research by bioarchaeologists.

3D scanning of cranial bones is one of the newest ways to attempt facial reconstruction, and has been quite useful in cases such as a man who died in Herculaneum during the AD 79 eruption of Mt. Vesuvius, whose head exploded from the pyroclastic blast. Reconstructing his skull from the various pieces, Pier Paolo Petrone and his researchers then used photogrammetry and scanning to create a full skull, gave him back some of his mandibular teeth/bulk, which had been resorbed due to age, and applied tissue depth and location layers to the scanned image, creating a series of images that moves from bone to full facial features.

This technique was also applied to a man from prehistoric England, who died approximately 4,500 years ago, and who was recently reconstructed at the Liverpool Face Lab. Here, however, there were fewer extant cranial bones, so the lab had to use educated guesswork to recreate certain facial features. The intent of the lab is to personalize the remains and in turn generate local interest in the people who formerly inhabited the island.

Finally, a reminder to be careful during excavations during this period of climate change: recent anthrax related deaths in thawing sections of tundra have brought to light the fact that global warming is releasing bacteria and viruses which have been dormant and encapsulated in ice or frozen ground, some for centuries. While medical scientists are working to minimize the potential risk for encounters, there is really no way to predict whether or not our current types of antibiotics and antivirals will be able to cope with any unknown diseases that may result.

New Journal Opportunities/New Podcasts

A new journal in the field of bioarchaeology, ***Bioarchaeology International***, has debuted, with its first issue available as of June. Emphasizing skeletal biological research, it aims to focus on innovations in fieldwork, methodology, and theory. Submissions are

now being accepted for the second issue. For more on this see: http://journals.upress.ufl.edu/bioarchaeology/.

The new podcast of the Human Biology Association, ***The Sausage of Science***, is actively seeking topic ideas, focusing on how science is done. The topic of the first two podcasts is "an interview with Dr. Sean Rafferty and his Science on Tap lecture in Albany, New York, on "How to Smell Bullshit" or the philosophy of scientific skepticism." The podcast can be found here: https://www.humbio.org/episodes-1-2/. Ideas for future episodes can be submitted by email here: cocobock@albany.edu or cdlynn@ua.edu, and by twitter at: @CaraOcobock, @Chris_Ly, or @HumBioAssoc.

The Archaeology Podcast Network hosts several interesting podcasts, including my favorite the "Women in Archaeology" podcast. You can visit the network here: https://www.archaeologypodcastnetwork.com/ and the WiA podcast here: https://www.archaeologypodcastnetwork.com/wia/ and contact the fabulous women who run it via email at womeninarchaeology@gmail.com or read their blog here: https://womeninarchaeology.wordpress.com/.

Fun Things to Do With Your Class

As summer comes to a close, some of us are undoubtedly finalizing syllabi for our fall courses. Seeking to find a balance between presenting information and keeping students engaged can be tough, so I try to find ideas that can be adapted into student projects that will both tempt the minds and efforts of the students, and not leave me with 40 copies of variations on the same paper to grade. In doing so, I came across this site, which shows how to mummify a Barbie™ doll: http://kidsactivitiesblog.com/9140/mummification-lets-mummify-barbie.

While the instructions are necessarily simplified for use by a young child, you can easily scale up the difficulty level to make this interesting and accessible for college students, even varying the type of funerary ritual (Make a Barbie™ in a jar! Or bury vampire/zombie Barbie™ for a Halloween class on supernatural death rituals!). In my forensics class, I will be having the students do crime scene reconstruction and analysis based on the graveyard scene in Harry Potter and the Goblet of Fire. Being creative benefits both teacher and student.

Until next time, dear readers!

ARCHAEOLOGICAL CERAMICS

Charles C. Kolb, Associate Editor

This issue contains Book Reviews on Ceramics.

The Oxford Handbook of Archaeological Ceramic Analysis. Alice W. M. Hunt (ed.), Oxford Handbooks. Oxford: Oxford University Press, 2017, xxxiv + 724 pp., 9 color plates, 55 black-and-white illustrations, 83 black-and-white line drawings. Print Publication Date: December 2016, ISBN: 9780199681532, £110.00 / $150.00 (hardbound) and ASIN: B01MSZFP77 Kindle edition. Published online: January 2017. DOI: 10.1093/oxfordhb/9780199681532.001.0001. Alice M. W. Hunt is an Assistant Research Scientist at the Center for Applied Isotope Studies, University of Georgia, Athens, Georgia, USA. She earned a BA in Anthropology (concentration in Archaeology) from Hamilton College, an MA in Ancient Near Eastern Languages and Literature from Fuller Theological Seminary (2005), an MSc in Technology and Analysis of Archaeological Materials, UCL Institute of Archaeology (2007), and her doctorate in Archaeological Materials Analysis also at UCL Institute of Archaeology (2012). Her Ph.D. focused on developing the cathodoluminescence spectrometry of quartz as a method for differentiating raw material sources in fine-grained ceramics. Much of Hunt's research has concentrated on ceramics. She is a Post-doctoral Research Associate at the University of Georgia Center for Applied Isotope Studies (2013-present). Currently, her research focuses on developing analytical calibrations and protocols for bulk chemical characterization of cultural materials (ceramics, anthropogenic sediments, copper alloys, and obsidian) by portable XRF. In her past and present research she utilizes sedimentary, igneous and metamorphic petrology and petrography; cathodoluminescence (CL) spectrometry and spectrography; SEM; SEM-EDS; EPMA-WDS; XRF, both ED (energy dispersive) and WD (wavelength dispersive); FTIR; INAA; X-ray radiography; and micro-computed tomography (micro-CT). Recent publications include "Portable XRF analysis of archaeological sediments and ceramics" co-authored with Robert J. Speakman in the *Journal of Archaeological Science* 53:1-13 (2015), in which they present a methodology for creating calibration curves for any XRF, LA-ICP, or AAS unit for conducting archaeometric work and they list the standards used to develop the calibration curves. She has also published a monograph based on her dissertation, *Palace Ware across the Neo-Assyrian Imperial Landscape: Social Value and Semiotic Meaning* (Leiden: E. J. Brill, 2015). Hunt's research is posted online on

Academia.edu: https://uga.academia.edu/AliceHunt , Research Gate: https://www.researchgate.net/profile/Alice_Hunt/citations , and Google Scholar Citations: https://scholar.google.com/citations?user=T2M2M48AAAAJ&hl=en. I can't think of a better scholar to organize and edit this comprehensive *Oxford Handbook of Archaeological Ceramic Analysis*.

Ceramics are one of the most complex and ubiquitous archaeomaterials in the archaeological record: it occurs around the world and through time in almost every culture and context, from building materials and technological installations to utilitarian wares and votive figurines. For more than 100 years, archaeologists have used ceramic analysis to answer complex questions about economy, subsistence, technological innovation, social organization, and dating. This handbook contains topics and methodologies essential for the sociocultural, mineralogical, and geochemical analysis of archaeological ceramics. This compendium contains 36 chapters prepared by 54 leading scholars, mostly European, many of whose names will be familiar to readers of the *SAS Bulletin*. The front material in this handbook includes a "List of Figures" (pp. xi-xvii); "List of Tables" (pp. xix-xx); "List of Plates, nine in color (p. xxi); "List of Abbreviations" (p. xxiii); and "List of Contributors" (pp. xxv-xxxiv). Each chapter has its own set of references. The volume is structured around seven themes: 1) Research design and data analysis, 2) Foundational concepts, 4) Evaluating ceramic provenance, 5) Investigating ceramic manufacture, 6) Assessing vessel function, and 7) Dating ceramic assemblages. It provides a common vocabulary and offers practical tools and guidelines for ceramic analysis using techniques and methodologies ranging from network analysis and typology to rehydroxylation dating and inductively coupled plasma mass spectrometry. The goal of each chapter is to provide theoretical background and practical guidelines, such as cost and destructiveness of analysis, for each technique, and detailed case studies illustrating the application and interpretation of analytical data for answering anthropological questions. A brief review of each chapter follows along with a concluding assessment.

Part I. Introduction. 1. "Introduction to the *Oxford Handbook of Archaeological Analysis*" Alice M. W. Hunt (UCL Institute of Archaeology and Center for Applied Isotope Studies, University of Georgia), pp. 3-6, 1 table. Hunt provides an overview of sociocultural, geochemical and mineralogical complexities inherent in archaeological ceramic analysis, and summarized briefly the parts and chapters in the volume. A table provides a very useful summary. Table 1.1 "Analytical methods [n = 22] included in the Handbook, and which of the four primary research questions [Provenance, Manufacture Technology, Function, Date] they contribute to answering" (p. 5). 2. "History of Scientific Research" Michael S. Tite (University of Oxford), pp. 7-17, 34 references. Tite discusses research aims in the reconstruction of production technology from raw materials through firing. An historical overview begins in 1961 and details the life-cycle of ceramics and methodologies: SEM, OES, INAAA, XRF, ICP-MS, chemical composition, organic residue analysis, the interpretation of the life-cycle and future developments.

Part II. Research Design and Data Analysis. 3. "Designing Rigorous Research: Integrating Science and Anthropology" Jaume Buxeda i Garrigós and Marisol Madrid i Fernández (Universitat de Barcelona), pp. 19-57, 5 figures, 7 endnotes, 47 references. The authors provide a flow chart characterizing ceramic studies from manufacture to the archaeological record. Archaeological processes, research problems, the identification of meaningful groups, provenance, aspects of ceramic manufacture, and formation processes are discussed. Terra Sigillata is considered in a case study. 4. "Evaluating Data: Uncertainty in Ceramic Analysis" Roberto Hazenfratz-Marks (Instituto de Pesquisas Energéticas e Nucleares), pp. 48-57, 1 table, 25 references. Expressions of uncertainty, natural and cultural variances, post-depositional issues, sampling variance, and analytical problems are reviewed. An example from the Central Amazon is used as a case study. 5. "Statistical Modelling for Ceramic Analysis" Gulsebnem Bishop (Stanford University), pp. 58-72, 7 figures, 2 tables, 9 references. The author considers statistical models involving qualitative data, quantitative data, and stem-leaf plots. Frequency tables, charts, histograms, and sampling types (simple random, stratified random, and systematic) are reviewed. He also evaluates issues in describing complex data (MRPP, KDE, PCE, t-test, and Chi-square). 6. "Data Recycling: Working with Published Data Sets" Matthew T. Boulanger (Southern Methodist University and University of Missouri Research Reactor), pp. 73-85, 1 figure, 2 endnotes, 61 references. Boulanger provides an historical perspective, reviews the concept of data recycling, and discusses work at the Lawrence Berkeley Laboratory on archaeometry and the use of archaeometric archives. He also looks backward and forward on this subject.

Part III. Foundational Concepts. 7. "Ceramic Raw Materials" Giuseppi Montana (Università di Palermo), pp. 87-99, 3 figures, 1 table, 19 references. Mineralogical and chemical characteristics, relevant physical properties,

experimental testing, and clay deposits are documented. 8. "Ceramic Manufacture: The *chaîne opératoire* Approach" Valentine Roux (Maison René-Ginouvès), pp. 101-113, 3 figures, 59 references. Roux reviews the social dimensions, and issues in describing identifying, and classifying assemblages, and interpreting *chaîne opératoire*. 9. "The Organization of Pottery Production: Toward a Relational Approach" Kim Duistermaat (Leiden University), pp. 114-147, 3 figures, 2 endnotes, 190 references. Duistermaat provides a background and history of ceramic ecology, typological approaches, Costin and Pool's characterization approaches (typologies in disguise), technology and human-thing relationships, (social construction, cultural and technical *chaîne opératoire*, behavioral archaeology, holistic approaches, and ontologies. She also considers relational views and entanglements (material properties and *chaîne opératoire*), biographies, locations in time and space, and analysis. 10. "Provenance Studies: Productions and Compositional Groups" Yona Waksman (CNRS - University of Lyon), pp. 148-161, 3 figures, 16 endnotes, 36 references. Waksman dedicates her essay in memory of Maurice Picon. Contexts of use (sites and workshops), ceramic type, sampling (unlocalized and localized production), compositional groups (classification and attributes), and chemical analyses are reported. A case study concerns ceramics from Medieval Beirut. 11. "Mineralogical and Chemical Alteration" Gerwulf Schneider (Free University of Berlin), pp. 162-180, 2 figures, 1 table, 6 endnotes, 50 references. Schneider documents mineralogical rehydration and rehydroxylation, the formation of gehlenite and calcite and alteration in sea water. Chemical alterations include considerations of water and calcium and contamination of Ba, Sr, Na, Ce, Mn, Fe, Cu, Zn, Pb, and Ag. 12. "Formal Analysis and Typological Classification in the Study of Ancient Pottery" Daniel Albero Santacrue (Universitat de les Illes Balears), Manuel Calco Trias (Universitat de les Illes Balears), and Jamie García Rosselló (Universitat de les Illes Balears), pp. 181-199, 3 figures, 1 endnote, 75 references. The authors discuss and classify form, document typological-interpretive tools, and consider pottery typologies (chronological, cultural, functional, metaphoric) and social dynamics. An error in the spelling Anna O. Shepard's name "Sheppard" occurs twice (p.183 and 199). 13. "Fabric Description of Archaeological Ceramics" Ian Whitbread (University of Leicester), pp. 200-216, 68 references. Ceramic fabrics, hand specimen studies, methods of description, and thin-section analysis of fabric groups and their description are reviewed. 14. "Analytical Drawing," Prabodh Shirvalker (Deccan College), pp. 217-231, 4 figures, 20 references. Shirvalker reviews monochrome line drawings and shaded illustration as well as the "new methods" of standard and digital photography.

Part IV. Evaluating Ceramic Provenance. 15. "Petrography: Optical Microscopy" Dennis Braekmans (Technische Universiteit Delft) and Patrick Degryse (Katholieke Universiteit Leuven), pp. 233-265, 3 figures, 1 table, 78 references. The authors review the kinds of information derived from thin-section petrography, constituents found in the sections, making of ceramic thin-sections, and concepts of optical microscopic petrography. Six sets of identifications are documented: color, PPL, and XPL, porosity, temper, fabrication, and firing conditions. Table 15.1 (covering ten pages) is a valuable resource. 16. "Ceramic Micropalaeontology" Ian Wilkinson (British Geological Survey and University of Leicester), Patrick S. Quinn (UCL Institute of Archaeology), Mark Williams (University of Leicester), Jeremy Taylor (University of Leicester), and Ian K. Whitbread (University of Leicester), pp. 266-287, 119 references. Microfossils encountered in archaeological ceramics are of three types: organic, siliceous, and calcareous. Sampling and analysis and interpretations of ceramic technology, provenance, ceramic function, and firing temperatures can be discerned. 17. "Electron Microprobe Analysis (EMPA)" Corina Ionescu (Babeş-Bolyai University of Cluj-Napoca) and Volker Hoeck (Universität Salzburg), pp. 288-304, 3 figures, 2 tables, 31 references. The authors review the principles of electron microprobe analysis, instrumentation, sample preparation, imaging compositional mapping, quantitative measurements, and advantages and disadvantages of the method. The analysis of ancient ceramics provided data on the matric, clasts, voids, firing phases, burial, and the sourcing of raw materials. 18. "Isotope Analysis" Bettina A. Wiegand (Georg-August-Universität Göttingen and Stanford University), pp. 305-326, 3 figures, 85 references. Discussions about ceramic raw materials, methods of analysis (isotope systems and mass spectrometry), and sample preparation precede provenance case studies of isotopes involving Sr, Nd, and Pb. 19. "X-ray Powder Diffraction (XRD)" Robert Heimann (Technische Universität Bergakademie), pp. 327-339, 4 figures, 2 tables, 38 references. The nature of XRPD, fundamentals of physics, powder methods, and applications precede case studies of Roman Terra Sigillata, earthenware, and stoneware. 20. "X-ray Fluorescence-Energy Dispersive (ED-XRF) and Wavelength Dispersive (WD-XRF) Spectrometry" Mark E. Hall (Bureau of Land Management, USA), pp. 342-362, 9 color plates, 16 endnotes, 98 references. Hall discusses anthropological and archaeological assumptions and issues regarding the method, sample selection and preparation, ED-XRF and detectors, WD-XRF and

detectors, and a comparison between the data produced. "Big questions" are also asked and answered. 21. "Handheld Portable Energy Dispersive X-ray Fluorescence Spectrometry" Elizabeth Holmqvist (University of Helsinki), pp. 363-381, 4 figures, 11 references. pXRF is discussed with reference to surface effects, particle size and mineralogy effects, data standardization, analytical protocols, mitigating issues (glazes, coatings, and pigments), and data interpretation. Readers may wish to augment this discussion by looking at recent publications by Hunt and Hunt and Speakman. 22. "Particle Induced X-ray Emission (PIXE) and Its Applications for Ceramic Analysis" Marcia Rizzutto (University of São Paulo) and Manfredo H. Tabacniks (University of São Paulo) pp, 382-398, 8 figures, 2 endnotes, 53 references. The method and theory behind PIXE are reviewed and work in the authors' laboratory at the University of São Paulo is documented, and external beam setup described. A case study involving Peruvian Chimu ceramics is presented. 23. "Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) and Laser Ablation Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS)" Mark Golitko (University of Notre Dame and Field Museum of Natural History) and Laure Dussubieux (Field Museum of Natural History), pp. 399-423, 6 figures, 2 tables, 69 references. The authors discuss the basics of ICP-MS and sampling techniques, laser ablation, and mass spectrometry. Applications to archaeological ceramic studies include provenance and paste analysis. They present a case study from the Sepik Coast of Papua New Guinea. 24. "Instrumental Neutron Activation Analysis (INAA) in the Study of Archaeological Ceramics" Leah D. Minc (Oregon State University Radiation Center) and Johannes H. Sterba (Atominstitut, Technische Universität Wien), pp. 424-446, 6 figures, 1 table, 53 references. The fundamental procedures if INAA, nuclear reactions, gamma ray detection, determining element concentrations, analysis of trace elements, and sample preparation are documented. Applications of INAA include provenance, production and exchange systems, and choices made by potters in vessel fabrication. 25. "Synchrotron Radiation" Alan F. Greene (Stanford University), pp. 447-467, 5 figures, 3 endnotes, 70 references. SR instrumentation, topics of pottery investigation (slips, glosses, and lusterwares), mineralogical and elemental characterization, and SR as an analytical sourcing tool are documented.

Part V. Investigating Ceramic Manufacture. 26. "Ethnography" Kent D. Fowler (University of Manitoba), pp. 469-486, 4 figures, 73 references. Fowler considers ethnography and constraints on ceramic manufacture, as well as the plurality of constraints: resources, processing, shaping, decoration, drying, firing, and post-firing. 27. "Experimental Firing and Re-firing" Małgorzata Daszkiewicz (ARCHEA, Freie Universituit Berlin) and Lara Maritan (Università degli Studi di Padova), pp. 487-508, 5 figures, 1 table, 42 references. The authors review open firing, experimental firing, re-firing, the reconstruction of original firing, and raw material classification using MGR (matrix groups by refiring)) analysis. Data reporting is also detailed. 28. "Fourier Transform Infrared Spectroscopy (FT-IR) in Archaeological Ceramic Analysis" Shlomo Shoval (Open University of Israel), pp. 509-530, 7 figures, 68 references. Shoval reviews the principles of infrared spectrographic studies, mineral compositions, sample preparation, and spectral analysis (spectra, curve-fitting, second-derivative, etc.), effects of the amounts of quarts, reference standards, and common absorption bands (quartz, silicates, calcite, and absorbed water). Archaeological applications include the identification of temper, paints, pigments, firing temperatures, and provenance. 29. "Raman Spectroscopy and the Study of Ceramic Manufacture: Possibilities, Results, and Challenges" Jolien Van Pevenage (Raman Spectroscopy Research Group) and Peter Vandenabeele (Ghent University), pp. 531-543, 4 figures, 1 table, 47 references. The authors review the theoretical approaches to the use of Raman spectroscopy, instrumentation, advantages and disadvantages of the method, and use in archaeological ceramic studies (ceramic mineralogy and glazed wares). Future prospects are also mentioned. 30. "X-ray Radiography of Archaeological Ceramics" Ian Berg (University of Manchester) and Janet Amber (The British Museum), pp. 544-564, 7 figures, 1 table, 47 references. Radiography and ceramic technology with respect to clay fabric and vessel formation are reviewed. The authors also discuss the theoretical background, methodology, equipment, and image enhancement to produce the best results. There is a useful section "tips and tricks," as well as three case studies: ceramics from the Cretan Bronze Age, Aegean stirrup jars, and Mycenaean pottery. 31. "Organic Inclusions" Marta Mariotti Lippi (University of Florence) and Pasquino Pallecchi (University of Florence), pp. 565-583, 7 figures, 40 references. The origins and nature of organic inclusions are documented, as well as their natural occurrences in raw materials and intentional additions of plant and/or animal organics; laboratory methods are reported. Such inclusions provide a variety of information: geography, depositional practices, agricultural practices, and chronological data.

Part VI. Assessing Vessel Function. 32. "Formal Typology of Iberian Ceramic Vessels by Morphometric Analysis" Ana Luisa Martínez-Carillo (Universidad de Jaén) and Juan Antonio Barceló (Universitat Autonoma de Barcelona), pp. 585-602, 5 figures, 4 tables, 54

references. The authors review the concept of "type," moving from visual data to types, criteria of morphological analysis, and mathematical morphology (using profiles and seriation). Ceramics from the Iberian Peninsula provide a case study. 33. "Mechanical and Thermal Properties" Noémi Müller (NCSR "Demokritos"), pp. 603-624, 1figure, 1 table, 26 references. She reviews the material properties of ceramics, provides a suggested methodology, and documents studies of experimental briquettes, manufacturing parameters, and data interpretation. Manufacturing ceramics with thermal properties, strength measurements of toughness (fracture energy), the role of quartz, shock resistance and, thermal conductivity, and other manufacturing parameters are reviewed. 34. "Assessing Vessel Function by Organic Residue Analysis" Hans Barnard (Cotsen Institute of Archaeology) and Jelmer W. Eerkins (University of California, Davis), pp. 625-648, 5 figures, 1 table, 162 references. The authors review microscopic methods and provide an overview of selected techniques (molecular methods and chemical analyses), and theoretical considerations.

Part VII. Dating Ceramic Assemblages. 35. "Typology and Classification" Eugenio Bortolini (UCL Institute of Archaeology), pp. 651-670, 5 figures, 92 references. Bortolini examines the definitions of typology and classification; they are not synonyms. He provides historical background and culture history, and reviews frequency and seriation, debates about "type," and classes and groups. A section of his chapter notes: "How many types and classifications?" A nine-point summary is quite valuable. 36. "Direct Dating Methods" Sophie Blain (Université de Liège) and Christopher Hall (University of Edinburgh), pp. 671-601, 5 figures, 53 references. Luminescent dating, TL to OSL, the physics of analysis, analytical protocols (sampling, sample preparation, and data reporting), and limits and potentials are documented. They also review rehydroxylation dating, the RHX process, rate and age equations, the effects of humidity and temperature, and methodology, lastly critiquing the method and its current status. This essay was prepared in August 2014 and readers will find additional information available regarding the efficacy of the proposed methodology.

The volume contains a highly-detailed "Index: (pp. 691-724), double-column, conflating topics and proper nouns, as well as references to figures, and tables. There are only a few spelling errors and errors in the alphabetical order of references. An earlier, preliminary "Table of Contents" included a half-dozen topics that had their own chapters but were not included as separate chapters: "Cathodoluminescence (CL) Spectroscopy Three-Dimensional (3D) Laser Imaging and Spectrometry," "X-ray Fluorescence-Energy Dispersive Spectrometry (XRF-EDS): Handheld Analyser," "X-ray Fluorescence-Energy Dispersive Spectrometry (XRF-EDS): Portable Analyser," "Computed Tomography (CT) Imaging," "Scanning Electron Microscopy (SEM) and Spectrometry," and "Three-Dimensional (3D) Laser Imaging." Nearly all of these topics have been considered within the 36 chapters reviewed above. One of the ceramic topics I might have included in this volume is a separate chapter or additional material on firing methods and measurements that encompasses open-pit firing through updraft kilns and more elaborate ceramic kilns such as "dragon" kilns.

As previously mentioned, I can't think of a better scholar than Alice Hunt to organize and edit this comprehensive handbook. The seven themes are well-chosen and she has select authors from among the very best cutting-edge and well-published researchers in the world. There is some variation in the length, but not necessarily quality, in these contributions. *The Oxford Handbook of Archaeological Ceramic Analysis* is a magnificent, superbly edited compendium that is an absolute "must have" for scholars who work with ceramics. It will be a close-at-hand handbook for many years to come. Congratulations to Alice, a fellow Pennsylvanian.

Integrative Approaches in Ceramic Petrography. Mary F. Ownby, Isabelle C. Druc, and Maria A. Masucci (eds.). Salt Lake City: University of Utah Press, 2016. xi +233 pp., 288 pp., hardback ISBN 9781607815068, $ 70.00; eBook ISBN 9781607815075, $56.00. Ceramic petrography, a microscopic examination of the mineral content and structure within ceramic thin sections, reveals the origin and movement of pottery and sheds light on the technology of the artifact. Practiced by archaeologists since the 1930s, ceramic petrography was less commonly practiced but there has been a resurgence and expansion of the procedure and in numbers of publications. This new contribution includes 14 papers authored by 28 specialists who cover a broad spectrum of regional and temporal contexts with case studies that provide practical examples combining petrography with scientific, ethnographic, and experimental methods. Your reviewer was an external reviewer of the manuscript of this volume for the University of Utah Press in 2014. I know all three editors and have reviewed a number of their monographs and other publications (see below).

Mary F. Ownby is the research petrographer at Desert Archaeology, Inc. in Tucson, AZ, and a research associate at the University of Arizona. She holds a

doctorate in Archaeology from Wolfson College, University of Cambridge, UK (2010); a M.Sc. (with Distinction) in the Technology and Analysis of Archaeological Materials, University College London, UK (2006); an M.A. in Egyptian Archaeology from the University of California, Berkeley (2004), and a B.A. (Magna cum Laude) in Anthropology from the University of Arizona (2000). Much of her research has focused in Egypt and the eastern Mediterranean and the American Southwest. For a list of her publications see https://desert.academia.edu/MaryOwnby/CurriculumVitae. Bettina Bader and Mary F. Ownby co-edited *Functional Aspects of Egyptian Ceramics in their Archaeological Context: Proceedings of a Conference held at the McDonald Institute for Archaeological Research, Cambridge, July 24th-July 25th, 2009* (Orentalia Lovaniensia Analecta, Leuven: Peeters Publishers, 2012) reviewed in *SAS Bulletin* 36(4):10-13 (2013). Isabelle C. Druc is a researcher at the Department of Anthropology a University of Wisconsin-Madison. She obtained her doctorate in Archaeology at the University of Montreal (Quebec, Canada), after finishing her initial studies in Switzerland. She specializes in ceramic studies, Andean archaeology, ethnoarchaeological research and ethnographic filming. She did post-doctoral studies at Yale University, and has been a visiting scholar at the CNRS in France and at the Smithsonian in Washington D.C. She has received two excellence awards from the University of Montreal in Canada and won the 1989 Plantamour-Prévost science prize in Switzerland for her Masters at the University of Geneva. She has been at the University of Wisconsin-Madison since 2000, holding positions of lecturer, honorary fellow, and associate researcher in the Wisconsin Center for Education Research (WCER). Druc has been involved in many different archaeological and ethnographic projects, in South America, the US and Europe, has published more than twenty articles and six books and has produced some 200 film documentaries and video interviews related to culture, language, ceramics, traditional arts and handicrafts. See https://wisc.academia.edu/Isabelledruc Bruce Velde and Isabelle C. Druc co-authored *Archaeological Ceramic Materials: Origin and Utilization* (Natural Science in Archaeology Series, Berlin and New York: Springer, 1999) reviewed in *SAS Bulletin* 23(1):17-21 (2000). Druc edited *Archaeology and Clays* (British Archaeological Reports International Series BAR S-942, Oxford: Tempus Repartarum, 2001) reviewed in *La Tinaja: A Newsletter of Archaeological Ceramics* 13(2):12-14 (2001) and she also edited *Portable Digital Microscope Atlas of Ceramic Pastes: Components, Texture, and Technology* with the technical assistance of Bruce Velde and Lisenia Chaves, Blue Mounds, WI: Deep University Press, 2015, and a Spanish-language edition), reviewed in *SAS Bulletin* 38(4):3-6. (2015). Maria A. Masucci is Professor of Anthropology and director of the Archaeology Minor at Drew University, Madison, NJ. She has a Ph.D. in Anthropology from Southern Methodist University, Dallas, TX (1992); an M.A. from Southern Methodist University; and a B.A. in Anthropology (Magna cum Laude) from Kenyon College, Gambier, OH. Masucci also did post-doctoral studies at the Center for Materials Research in Archaeology and Ethnology, Massachusetts Institute of Technology, Cambridge, MA, focusing on the materials analysis of Prehispanic ceramics. She has conducted research in the United States, Mexico, Honduras, and Ecuador, and her laboratory research focuses on the reconstruction of ancient ceramic technology utilizing petrographic thin section analysis of sediments and fired ceramics. See http://www.drew.edu/anthropology/faculty/maria-masucci-curriculum-vitae.

Integrative Approaches in Ceramic Petrography has a "List of Figures" (pp. vii-ix), a "List of Tables" (p. xi), "List of Contributors" (pp. 225-226), and a detailed double-column "Index" (pp. 227-233) comprised of proper nouns and topics. In the "Introduction" by Mary F. Ownby, Isabelle C. Druc, and Maria A. Masucci (pp. 1-7, 44 references), the editors discuss the importance of petrographic analysis to archaeology and provide a brief historical overview of the methodology. The papers in this volume derive from a symposium, "Petrography's Continued Role in Ceramic Studies: New Advances and Debates," organized for the Society for American Archaeology annual meeting in 2012 by Mary Ownby and Sophia Kelly to consider methodological significance and draw renewed attention to it in the light of new instrumentation such as XRF. They note a number of major publications, *châine opértoire*, and the goal of integrating the results of ceramic petrography with other types of data. They point out that this volume does not present "new methods" but rather the use of existing techniques combined with other methods (petrography and chemistry, petrography and experimental analysis, and petrography and ethnographic research (p. 3) among others, followed by brief summaries of chapter contents. Your reviewer attended the majority of these oral papers and PowerPoints on 22 April 2012. In my review for the University of Utah Press in 2014, I noted that seven of the oral presentations became contributions to the proposed book; three written chapters were similar to the original oral presentations, two were significantly revised, and three were different contributions, while six chapters have been prepared by authors not associated with the 2012 symposium. The editors pointed out that the proposed book has the aim of presenting the "current status" and

"future directions. It is obvious to me that a great deal of thought led to revisions and strengthening of the original oral presentations.

Chapter "1. Petrography First: Issues of Identification and Sourcing Volcanic Ash Temper in Maya Pottery" by Anabel Ford, Frank J. Spera, and Connie Christensen (pp. 8-23, 6 figures, 3 table, 40 references) provides an important review of the results of petrographic and microprobe data on volcanic ash temper found in Maya ceramics from the site of el Pilar, Belize, locates 50 miles east of Tikal Guatemala. The chapter is logically organized and clearly presents the background, geological landscape, volcanic ash characterization, macroscopic assessment, petrographic analysis, and microprobe study. Eighteen specimens were studies in detail with petrographic results summarized in Table 1.2 and microprobe analysis in Table 1.3. Ford and Spera have been pursuing this "Holy Grail" of ash origin for quite some time and it is important to have a current summary of their work. Discussions focus on heterogeneity and homogeneity. The difficulties in identifying chemical and petrographic differences with the goal of sourcing the provenance of the ash reveals how challenging this can be with certain material types. "2. The Importance of Petrography for Interpreting Compositional Data: A Case Study of Tanque Verde Red-on-Brown" by Mary F. Ownby (pp. 24-38, 7 figures, 2 tables, 26 references). The Tucson Basin of the American Southwest has great geological diversity which permits combining data from petrographic studies with neutron activation analysis (NAA). Ownby has prepared an excellent overview of the subject and focuses on one pottery type (691 specimens) from five regions and nine compositional groups; three groups (A, BC, and J) are the focus of a detailed analysis. The chapter is updated from her oral presentation in 2012. Prior research conducted in 1957 and 1996 and especially sampling and methodologies are presented clearly and related to the NAA data set, leading to a stronger assessment and understanding of archaeological distribution and production sites. In some cases with only a few thin section studies, chemical groupings could be assigned to a provenance and the network of exchange patterns more clearly delineated.

"3. The Organization of Ceramic Production and the Origins of Complexity in the Late Prehispanic Coastal Societies of Ecuador" by Maria A. Masucci, Hector Neff, Michael D. Glascock, and Jeff Speakman (pp. 39-52, 7 figures, 1 table, 42 references). As in the previous chapter, the authors combine data from petrographic studies with neutron activation analysis (NAA) in their assessment of the technology of fine paste blackwares from the late Prehispanic Manteño-Guancavilca culture of the Chanduy Valley, coastal Ecuador. The focus is on the regional chronology (emphasis 200 BC-AD600/800), diagnostic decorated fineware, fabric classes and elemental compositional groups derived from the analysis of 348 ceramics specimens, 62 clay sources, and 39 rock types. The authors examine provenance and production centers, and demonstrate the diachronic continuity of production of finewares and discern multiple production locales through elemental analysis. Some pottery vessels came from outside the local area suggesting that vessels circulated within the region through feasting and gift exchanges. "4. Petrography and pXRF at San Pedro de Atacama, Northern Chile: Exploring Ancient Ceramic Production" by Emily M. Stovel, Beatriz Cremonte, and Ester Echenique (pp. 53-72, 8 figures, 4 tables, 5 endnotes, 62 references). This is a chapter added after the 2012 symposium and constitutes a valuable contribution to this volume. Middle period ceramics (AD 500-900) from this Chilean site were studied using petrographic analysis (point-counting) and portable X-ray florescence (pXRF). Paste mineralogy comparisons, data are presented and the authors anticipate future research using LA-ICP-MS or SEM-EDS on these Chilean specimens. There is a persistence of ceramic style in petrographic groups (a total of 100 specimens representing three wares); the study focuses on the study of two paste groups (Enchinique) and five past groups (Cremonte) and 40 data sets. pXRF studies discerned differences in Mn, As, Ba, Fe, and Zr content. The quantification of specimens is good and they mention specific statistical techniques. The data indicates that similar raw materials were used in the production of fine and coarse wares which were recovered from both domestic household and burial contexts. The discussion of homogeneity and social change suggested a lack of specialization by ware.

"5. Technical Comparisons of Halaf and Ubaid Sherds from Tell Ziyadeh: A Pilot Study" by Yukiko Tonoike (pp. 73-85, 6 figures, 1 table, 32 references). This paper, not a part of the 2012 symposium, deals with northern Syrian Halaf and Ubaid sherds and presents data on ceramic raw materials using petrography and XRD. Tell Ziyadeh is located in the Khabur River Basin of northern Syria and Halaf specimens date 5900-5300 BC while Ubaid dates 4700-4600 BC. The painted sample size is small: 7 Halaf and 10 Ubaid. The specimens studied macro- and microscopically through thin-sections are quantified and fired soil/clay samples are also examined. XRD was used on four sherds and three soil samples. She notes that this is a pilot study and that a much larger sample is needed. "6. Petrography in the Age of Instrumental Characterization: An Example from Honey Bee Village, Pima County, Arizona" James M. Heidke (pp. 86-103, 7 figures, 4 tables, 64 references). This

superb chapter is similar to the 2012 oral presentation. There is an excellent introduction and discussion of methodologies, chronology (Preclassic AD 500-1150 and Classic 1250-1300 sample sizes (100 specimens), sources and types of temper, and ceramic variations. Five variables are reported: time, ceramic ware, temper sources, temper variability, and vessel function. The author discusses scatter plots, and archaeological conclusion, documenting that there was little change in ceramic production. The presentation demonstrates the importance of ceramic petrography and specificity over bulk chemical analysis.

"7. The Contribution of Petrography to Understanding the Production and Consumption of Early Helladic Ceramics from Nemea, Mainland Greece" by Clare Burke, Peter M. Day, and Daniel J. Pullen (pp. 104-115, 6 figures, 1 table, 39 references). This is a "new" contribution solicited after the 2012 symposium. Macroscopic and petrographic data (point-counting) show the complexity of scale of production and distribution of ceramics, a diachronic shift to multiple producers, and consumption and technological choices. The chronology (Aegean Bronze Age: EBA 3100-2100 BC; MBA 2000-1600 BC and LBA 1600-1000 BC), previous reliance on chemical data, specifics on the site location, environment, and sample selection (204 sherds) are documented. Selection procedures and methodologies are presented generally; technological practices and areas of production are documented. A variety of ceramic vessel types were acquired from producers fabricating the wares at considerable distances from Nemea in Early Helladic I times. By Early Helladic II pottery was obtained from fewer manufacturers. The results for EH I-Early EH II also contrast to EH II, "Developed," and EH III fabrics. "8. The Use of Loess in Pottery Manufacture: A Comparative Analysis of Pottery from Yinxu in North China and Linearbandkeramik Sites in Belgium" by James B. Stoltman (pp. 116-127, 7 figures, 6 tables, 19 references). This is a "new" contribution solicited after the 2012 symposium and is an extremely valuable body of comparative research on the selective use of loess in ceramic production in north China at Yinxu, last capital of the Shang Dynasty near Anyang and in the Hesbaye region of northeast Belgium. The analytical methodology (previously detailed by Stoltman 1989, 1991, 2001) are reviewed, thin-section samples are documented (China n = 32 and Belgium n = 35), geology (sediments), loess compositions, wares, and tempers are detailed. Petrography is used to discern the physical properties of loess and to show that loess is employed for local non-cooking fine wares; technological practices and areas of production are delineated, and alluvial clays were employed in making coarse ware cooking vessels and related to thermal shock properties. Technological limitations account for not using loess in the production of the cooking vessels. At Yinxu, 3/13 samples were untempered, 4/13 were sand tempered, and 3/13 had various other tempers.

"9. Clay Pellets in Hohokam Red-on-Buff Pottery: Shifts in Pottery Recipes and the Organization of Ceramic Production" by Sophia E. Kelly (pp. 128-143, 7 figures, 2 table, 46 references). Kelly's original 2012 paper dealt with schist-tempered pottery, so this is a different contribution to Hohokam ceramic analyses in the Phoenix Basin (13 sites on the Salt and Gila Rivers) in four phases spanning AD 700-1020. This chapter is a significant contribution to a little-studied "problem" of clay pellets versus clay tempers, the use of grog, and argillaceous rock fragments. Binocular and petrographic data are presented on 182 thin sections and specimens quantified. Alluvial clays, clay mixing, and the addition of salt are discussed as is firing temperature. Argillaceous inclusions and types and alluvial clays are detailed. Diachronic temporal changes and major production areas are considered, while an increase in ceramic production suggests a likely reorganization of pottery production; future chemical research anticipated to identify pellet origins. "10. Looking for the Right Outcrop: Ceramic Petrography in the Peruvian Andes" by Isabelle C. Druc, Kinya Inokuchi, Victor Carlotto, and Pedro Navarro (pp. 144-156, 7 figures, 1 table, 22 references). This chapter is similar to the 2012 oral presentation. Druc's oral and published research is highly regarded. The Kunta Wasi site and its Formative period chronology are detailed and site ceramic specimens were examined by petrography, XRD, and SEM; ceramic ethnoarchaeology also played a role in the research design and analysis. Geological data and archaeological and ethnographic contexts and prior research are reviewed, and five petrogroups (three local and two non-local), and "best candidates" are related. Itinerant potters, multiple production loci, and producers employing different sources or distinct past recipes are reviewed. Additional quantification of specimens and ethnographic work might narrow provenance possibilities of in-site or off-site production. "11. Petrography and Behavior When the Minerals Do Not Change: Textural Analysis of Disaster Impacts on Historic Hidatsa Potting Practices, North Dakota" by Kacy L. Hollenback (pp. 157-176, 9 figures, 2 table, 69 references). This is a "new" chapter that characterizes temper attributes and pottery making through time and smallpox as a demographic disaster related to the maintenance or modification of the craft. The Hidatsa of the northern North America Great plains are adequately described, the epidemics characterized, and binocular and petrographic thin-section data related. A total of 2,638 body sherds

from five sites were studied by binocular microscopy but only ten thin sections prepared for further analysis; hence, the quantification of the ceramics and specimens analyzed is thin. Hidatsa pottery-making, temper characteristics (types, percentages, sizes, and sorting), and texture analysis (following Peacock 1971) are related. Temper includes quarts, feldspar, and mica. Alternative conclusions can be inferred – persistence of the craft through time, culturally coping with demographic loss, an influx of new potters in the post-epidemic period, and the impact of European trade goods replacing native pottery.

"12. Field-Based Experiments Replicating Ceramic Fabrics: Late Bronze Age Cookwares from Two Mediterranean Sites" by Jerolyn E. Morrison and Mara T. Horowitz (pp. 177-195, 12 figures, 2 tables, 39 references). This is another "new" chapter recruited after the 2012 symposium. Fabric and vessel reproduction experiments remain a valuable source of information for understanding archaeological and ceramic ethnoarchaeological data (analytic and observational). Morrison works with ceramics from Mochlos, a Minoan coastal settlement on Crete, while Horowitz focuses on Tell Atchana in the Amuq Valley of the Levant; both sites produced cookwares during LM I and LB I periods. The sites, archaeological explorations, regional geology, cookware fabrics and recipes are documented, and replica pinch-pots made, fired, and studied. Methods include qualitative petrographic analyses and locating and processing raw materials are documented. Table 12.1 presents macroscopic data on archaeological fabric analyses, while Table 12.2 provides a summary of the experimental data. The information on mussel shell spalling is quite interesting, especially on the baking vs. boiling of the shell. "13. Point/Counter Point II: The Accuracy and Feasibility of Digital Image Techniques in the Analysis of Pottery Tempers Using Sherd Edges" by Patrick C. Livingood and Ann S. Cordell (pp. 196-214, 7 figures, 10 tables, 2 endnotes, 25 references). This is a very important contribution to the important issue of digital imaging as an alternative to traditional ceramic petrographic thin-section analysis. As a case study, 25 shell tempered Mississippian period sherds are evaluated from the Moon site in Arkansas, USA. Point counting is quantified (see Tables 13.1, 13.2, and 13.3), paste constituents detailed, resource and temper categories reviewed (principal vs. accessory aplastics are differentiated), and the digital image analysis characterized. Valuable results on over- and undercounting, the problem of voids, resolution and focus issues, and unit costs and time required per specimen are documented. The authors compare advantages and disadvantages of digitization and conclude that there is "mixed success" in that petrography and digital imaging can be complementary and that petrographic point-counting is valuable for heterogeneous and unknown samples while digital imaging is useful for large homogeneous collections.

"14. Ceramic Petrography: Integration, Adaptation, and Innovation" by Ian K. Whitbread (pp. 215-223, 36 references). This contribution is a current status overview of the integrative aspects of ceramic petrography and not a summation of or a discussion about the other contributions to this volume. He offers pertinent comments on the value and importance of ceramic petrography and that at times it is" underutilized." The discussion of the integration of petrography and bulk chemistry is brief but excellent and he comments on the paradigm shift that took place in the 1990s when researchers became interested in socially embedded technologies in the artifacts. (Wasn't Fred Matson talking about this as early as 1965?) The section on "From Assemblage to Laboratory and Back: Macroscopic and Microscopic Analysis" precedes a valuable discussion of petrographic description and characterization, and petrographic methods and interpretation. Assemblages and macro- and microanalysis are considered, petrographic descriptions and characteristics are reviewed, as are petrographic methods and interpretations. There is, he rightly notes, "no substitute for fieldwork and an open mind." Whitbread examines some future research directions and concludes that his comments are from a "personal perspective" and that ceramic petrography as an analytical technique is open to integration, adaptation and innovation. This is a splendid conclusion to this volume.

The varied uses of ceramic petrography and the insights it has generated illustrate the continued significance of this method for understanding past societies. *Integrative Approaches in Ceramic Petrography* highlights new results from this field and incorporates it in the narratives. Over the past decade, there have been a number of other volumes published that deal with ceramic petrography which have been reviewed in the *SAS Bulletin*. These include: Chandra L. Reedy (2008) *Thin-Section Petrography of Stone and Ceramic Cultural Materials*. Archetype Publications, London. *SAS Bulletin* 31(4):18-20 (2008); Patrick S. Quinn. S. (ed.) (2010) *Interpreting Silent Artefacts: Petrographic Approaches to Archaeological Ceramics*. Archaeopress, Oxford. *SAS Bulletin* 33(3):5-9 (2011); and Patrick S. Quinn (2013) *Ceramic Petrography: The Interpretation of Archaeological Pottery & Related Artefacts in Thin Section*. Archaeopress, Oxford. *SAS Bulletin* 36(3):7-10 (2013). Prudence M. Rice (2015) also reviews the utility of the method in *Pottery Analysis: A Sourcebook*, 2nd ed.

University of Chicago Press, Chicago. *SAS Bulletin* 38(3):3-7 (2015). Interested readers may wish to compare the content of these books with Ownby, Druc, and Masucci's new contribution to this literature. They demonstrate the resurgence of ceramic petrographic analysis in these diverse essays that geographically span the American Southwest to northern China, and chronologically 5,000 BCE-19th century CE. The introduction by Ownby and final chapter by Whitbread summarize the status of current research. This is an essential, authoritative and compelling anthology that emphasizes methodologies and new investigations elucidating broader anthropological questions.

China's Porcelain Capital: The Rise, Fall and Reinvention of Ceramics in Jingdezhen. Maris Boyd Gillette. London, Oxford, and New York: Bloomsbury Academic, 2016. xiii + 183 pp., 18 black-and-white and 4 color plates, 7 line drawings, 7 tables. ISBN 9781474259415. List price: $108.00, online price: $97.20 (hardcover). The author is the E. Desmond Lee Professor of Museum Studies and Community History, University of Missouri, St Louis, USA. She is the author of *Between Mecca and Beijing: Modernization and Consumption among Urban Chinese Muslim* (Stanford: Stanford University Press, 2002) in which she examines how a community of urban Chinese Muslims uses consumption to position its members more favorably within the Chinese government's official paradigm for development. Residents of the old Muslim district in the ancient Chinese capital of Xi'an belong to an official minority (the Hui nationality) that has been classified by the state as "backward" in comparison to China's majority (Han) population.

Between Mecca and Beijing is a combination of ethnography and history. Readers will perceive Gillette's investigative skills in this new volume, *China's Porcelain Capital*, in which she discusses the history of Jingdezhen, China's "porcelain capital," from 1004 CE, during the Song Dynasty, to the present day. Gillette explores how Jingdezhen has been affected by state involvement in porcelain production, particularly during the 20th century. She documents how the Chinese government has consumed, invested in, taxed and managed the local ceramics industry, and details the effects of state intervention on artisans' lives, their local environment, and the nature of the goods they produce. She reviews how Jingdezhen experienced the transition from imperial rule to state ownership under communism, the changing fortunes of the ceramics industry in the early 21st century, the decline that accompanied privatization, and a revival brought about by an entrepreneurial culture focusing on the manufacture of highly-prized "art porcelain."

Jingdezhen is a prefecture-level city, previously a town, located in northeastern Jiangxi province, China. Gillette's history does not begin until the year 1004. It is regarded as the "Porcelain Capital" because it has been producing pottery for over 1,700 years and made blue-and-white ware famous throughout the world. The city's well-documented history covers more than 2,000 years since the Han Dynasty (202 BCE - 220 CE); see an article by Charles C. Kolb in *The Berkshire Encyclopedia of China* (Linsun Cheng, ed.); Great Barrington, MA: Berkshire Reference Works [electronic version] and New York: Charles Scribner's Sons [print version], 2008, pp. 985-990. During the Han period, Jingdezhen was known as Xinping and archival records record that it was during this era that porcelain production began. The town was renamed Changnanzhen (Changnan Town) during the Tang Dynasty because it is located on the south bank of the Chang river. In 1004 CE during the North Song Dynasty, it was renamed again as Jingdezhen, taking the era name of the emperor during whose reign its porcelain production first rose to fame. During the Ming and Qing dynasties (1368-1644 and (1644-1912), Jingdezhen was considered one of China's four great towns in terms of commercial and industrial importance. The others were Foshan in Guangdong province, Hankou in Hubei, and Zhuxian in Henan.

Gillette's book provides 18 splendid color and 4 monochrome plates (inserted between pp. 100-101); 18 monochrome and color plates; "Acknowledgments" (pp. x-xi) mostly to the Philadelphia Museum of Art and Freer-Sacker Galleries; "Notes on Names and Translations" (p. xii); a useful 44-item "Glossary"; 471 "[End]Notes" (pp. 137-161; a "Bibliography" with 158 entries -- six are to Gillette's own works -- (pp. 163-172); and a double-column "Index" that conflates proper nouns and topical entries (pp. 173-183). There are a few references to *Science and Civilisation in China: Volume 5, Chemistry and Chemical Technology, Part 12, Ceramic Technology*, Rose Kerr, ed., written by Rose Kerr and Nigel Wood, with additional contributions by Ts'ai Mei-fen and Zhang Fukang, Cambridge and New York: Cambridge University Press, 2004. This magnum opus was reviewed for *SAS Bulletin* 28(1-2):24-27 (Spring-Summer 2005) by Kolb.

The volume has seven chapters covering 131 pages, five of which focus on the prehistory or history of Jingdezhen's pottery production during numerous major changes in Chinese economic and political systems. "Chapter 1. The world's most famous ceramics and the people who made them" (pp. 1-10, 15 endnotes). There are discussions about major museum collections, ceramic manufactures founded to compete with Jingdezhen,

imitators of blue-and-white ceramics (China to Europe), and innovators. The author focuses on the industry and production management over the past 150 years and discusses the basics of ceramic production (clays – china stone and kaolin, fuel, and transportation) and that there has been little change since the 11th century. She also details the scope of her book and research materials and methods, notably historical and economic records, government documents, and ethnographic sources (consultants), and the history of "big government."

"Chapter 2. Creating a porcelain capital, prehistory to 1785" (pp. 11-28, 99 endnotes). Gillette mentions briefly high-fired ceramics from the Shang Dynasty (ca. 1600 BCE), Han Dynasty (206 BCE-CE 200) pottery, and Early Tang Dynasty (618-906 CE) celadon stoneware. She characterizes Early Jingdezhen lineage schools, central government control of the porcelain trade and taxes, the foundation of the Mongol Yuan Dynasty (1280-1263) and labor specialization (p. 16). By the end of the Ming Dynasty (1368-1644), Jingdezhen became part of an imperial manufactory with production designated solely for the court. Ceramists came from the town and laborers were temporary conscripts and gilds and merchant brokers emerged. Kiln types (dragon, montou, gourd-shaped, egg-shaped, and muffle kilns [the latter for overglaze enamels] are documented briefly), the use of saggars, and pigments are noted. There were 3,000 kilns in Jingdezhen by 1712. Gillette also details the production of antique replicas, the imperial manufactory, specialized workshops using commercial kilns, and pigment production and brush making as well as the popularity of overglaze enamels. She notes that the 18th century was a "golden age in terms of quality and quantity of ceramics produced. "Chapter 3. Decline and disarray, 1786 – 1948" (pp. 29-41, 2 tables, 40 endnotes). Workshops and kilns are reviewed but the lack of an adequate transportation system hampered the distribution and export of ceramics while at the same time a major competitor, Meissen, was making inroads in China as it was losing the European market. This was a time period exacerbated by Chinese government disinvestment in Jingdezhen while domestic rebellions and foreign incursions took place, namely the Opium Wars (1839-1842 and 1856-1860), the Taipei Rebellion (1850-1864), and Sino-Japanese War (1894). The introduction of a transportation tax, floods that destroyed kilns, and concessions to foreign powers aggravated attempts to revive the domestic Chinese industry including the workshops at Jingdezhen and simultaneously enhanced the import of "non-Chinese" porcelain (1850-1945). During these troubled times ceramic guilds were a positive, stabilizing force while there were concurrent domestic market contractions, strikes, riots, boycotts, and armed conflicts. Twenty incidents (1800-1948) are listed in Table 2. The Jiangxi Porcelain Company was created in 1910 but Chinese Communist Party influence (1928-1933) gained strength while the guilds in the party's view became "obstacles to production." Your reviewer finds this to be a potentially unbalanced account of the last five decades of the era as there is no discussion of the effects on greater China and ceramic production of the "Boxer Rebellion" or Yihequan Movement, an anti-imperialist Chinese uprising (1899-1901), and the effects of World Wars I and II are, sadly, barely mentioned.

"Chapter 4. Production and politics, 1949 – 1972" (pp. 43-69, 1 table, 130 endnotes). The chapter title is most appropriate as the People's Liberation Army entered Jingdezhen on 29 April 1949 and soon reinstated state management over porcelain production. There was an economic recovery (1949-1952) which included an experimental socialist porcelain workshop and the founding of the Porcelain Industry Company in 1950, and creation of a state-private economic system in Jingdezhen. The "Great Leap Forward" (2 March 1958 ff.) resulted in ceramic factory mechanization and the creation of three separate porcelain factories (Red Star, East Wind, and Build the Nation). The Red Guard formed a Revolutionary Management Committee and appropriated the Porcelain Industry Company. Gillette discusses the impacts on labor and porcelain production, and this period of havoc in the industry. "Chapter 5. Dual track porcelain, 1973 – 1993" (pp. 71-90, 2 tables, 90 endnotes). Discussion begins with the visit of Americans from Boehm Porcelain of Trenton, NJ on 7 December 1974 (the first by Americans since the 1920s) and subsequent emergence of dual track production by state-level facilities and collectives. Other foreign delegates soon visited and Jingdezhen participated in international ceramic-making competitions (1974-1984), winning a number of events. A tour of eight porcelain factories by Deng Xiaoping on 7 February 1973 stimulated reforms and new openings in the industry and foreign trade and investment. In 1982 Jingdezhen was awarded national status as a historic place for its 30+ kilns dating from the Five Dynasties period through Qing Dynasty – ca. 907-1912. Twenty-three state-owned factories and 29 large collective porcelain producers were overseen by the Porcelain Industries Company. The number of private producers increased from 42 in 1986 to >1,000 by 1993. Gillette describes the organizational structure of the state and private collectives and the unusual autonomy given to the latter. A notable production change was the introduction of propane as a kiln fuel in 1992.

In "Chapter 6. Porcelain capital no more, 1994 – 2010" (pp. 91-113, 1 table, 56 endnotes) she traces the decline

of the number of workers in Jingdezhen during the 15-year period (254,900 to 138,800) but the concurrent rise of daily use porcelain produced (418,860,000 to 480,000,000 pieces). The details of this change are documented in her ethnographic interviews with specific potters and officials. Decollectivization began in November 1993 and some factories were sold (for example East Wind), while the production of art porcelain and replicas of historic Qing porcelain increased dramatically. There is an informative but brief section on the "aging" of newly-produced vessels to make them appear old. Porcelain fakes on the domestic and international art markets became a problem, even in China; the Jibaozhai Museum collection had 80,000 counterfeit with only 80 authentic vessels and, lastly, one-third of the Luching Museum's 8,000 objects were imitations. Foreign investors in Jingdezhen included Taiwan, France, Germany, Austria, Switzerland, and the United States. Among the latter were American luxury department stores. Chapter 7. From porcelain capital to heritage site" (pp. 115-131, 41 endnotes). The development of tourism and redevelopment/urban renewal at Jingdezhen resulted in a dramatic rise in cultural tourism; 100,000 visitors in 2000 and an astounding 25,850,800 in 2014. Authorized archaeological excavations resulted in the discovery of Ming Dynasty imperial kilns and late Qing Dynasty facilities. Jingdezhen also saw the development of artistic residences and artists colonies. A bid by the Ancient Kiln Folk Customs Museum for UNESCO World Heritage status was filed in 2013. As this book review is written in mid-March 2017, "Ancient Porcelain Kiln Site in China (29/01/2013)" appears on UNESCO's "Tentative List." http://whc.unesco.org/en/tentativelists/state=cn.

This volume focuses on the political and economic history of this pottery-producing site which rose from simple beginnings to prominence, decline, resurrection, and more recently degeneration under the Nationalist Republic, revival again under Mao's state socialism, and abrupt curtailment during China's economic reforms of the 1990s, only to once again emerge this time as a destination for tourists and artists in the 21st century. Gillette illustrates the complexities of contemporary ceramic production in Jingdezhen and wisely uses her ethnographic interview data. There is minimal information on ceramic workshops and kilns and range of products but there is some information on recent ceramic production.

A Universal Theory of Pottery Production: Irving Rouse, Attributes, Modes, and Ethnography. Richard A. Krause, Caribbean Archaeological and Ethnohistory series. Tuscaloosa: University of Alabama Press, 2016. ix + 214 pp., 52 black-and-white figures, 1 map, 9 tables. ISBN 978-0-8173-1898-7, $54.95 (cloth), ISBN 978-0-8173-8944-4, $54.95 (e-book). Krause's field research has been conducted in the Great Plains of North America, Alaska, South Africa, Yucatán, and especially the Southeastern United States. He is professor emeritus of archaeology at the University of Alabama and senior archaeologist at Tennessee Valley Archaeological Research. He is the author of several books and archaeological monographs, including *The Clay Sleeps: An Ethnoarchaeological Study of Three African Potters*, University, AL: University of Alabama Press, 1985; *The Leavenworth Site: Archaeology of an Historic Arikara Community*, Lawrence, KS: University of Kansas Press, 1972; and *The Snodgrass Small Mound and Middle Tennessee Valley Prehistory*, Chattanooga, TN: Tennessee Valley Authority, 1988; and is a coauthor, with Ned J. Jenkins, of *The Tombigbee Watershed in Southeastern Prehistory*, University, AL: University of Alabama Press, 1986).

The book under review focuses on a comprehensive analysis of pottery excavated from the highly stratified archaeological site of Paso del Indio in Puerto Rico. Krause assesses the theory behind archaeological classification systems not from the usual perspective of statistical methods to frame basic archaeological concepts, but from the viewpoint of epistemology and the explicatory practices of empirical science. Therefore, this work is a departure from most books in which the assessments of pottery utilize such procedures to structure and substantiate archaeological concepts. Krause hypothesizes that the careful analysis of ceramics from an archaeological site can be used to formulate a step-and-stage theory of pottery production for an area or region. He suggests that by comparing the results of inquiries conducted at different sites and for different times, archaeologists may be able to create a "general ethnographic theory of pottery production." Initially he provides a comprehensive explanation of the archaeological concepts of attribute, mode, feature, association, site, analysis, and classification. Employing these seven concepts, Krause categorizes the production and decorative techniques in ceramics from the Paso del Indio site. Next he applies the concept of "focal form vessels" to the site's largest pottery sherds to test his step-and-stage theory of production against the evidence they provide. Lastly, he assigns the ceramics at Paso del Indio to previously discussed potting traditions. In essence, Krause reapplies and revises methods and theories developed initially by his mentor Yale archaeologist Irving Rouse (1913-2006) who had developed these during field research in the Greater and Lesser Antilles of the Caribbean, and Florida and Venezuela. Rouse made

significant contributions to the development of archaeological theory, with a special emphasis on taxonomy and classification of archaeological materials and studies of human migration. He developed the mode-attribute analysis technique, which examines clusters of traits independently of type, as an alternate to type-variety analysis because he believed that it is more sensitive to diachronic change. There are 14 references to Rouse's work in Krause's book, notably "The Classification of Artifacts in Archaeology," *American Antiquity* 25(3):313-323. 1960. In sum, Krause demonstrates Rouse's impact on American archaeology and theories behind classification systems.

A Universal Theory of Pottery Production is a thoughtful volume that commences with an "Introduction" (pp. 1-6),followed by nine numbered chapters, "Works Cited" (pp. 199-207) with 132 entries, and a double-column "Index" (pp. 209-214) that conflates topics and proper nouns. The narrative is supplemented by 132 illustrations and ten tables. Interestingly, there are no references to major theoretical treatments by scholars such as Dean E Arnold, Prudence Rice, and Anna O. Shepard (see my review of *Pottery Analysis: A Sourcebook*, 2nd ed. by Prudence M. Rice, Chicago: University of Chicago Press, 2015, reviewed in *SAS Bulletin* 38(3):3-7 (Fall 2015).

"Introduction: (pp. 1-6). Krause discusses the concept of "archaeologically derived ethnographic account of pottery production"; the elements of attribute, mode, feature, association, site, analysis, and classification; the need to create a "focal form" and the need to organize evidence by production steps and stages. The influence of a number of mentors is acknowledged (especially Rouse, Conklin, Lounsbury, and Holder) and the 1960s wave of the "new archaeology" and "processual archaeology" (e.g., Flannery, Binford, Deetz, and Longacre), "behavioral archaeology" (Schiffer), "postprocessual archaeology" (Duke, Wilson, and Hodder), "neo-Darwinian archaeology" (Read), and "landscape archaeology" (Duke). Concepts postulated by these authors are drawn into Krause's subsequent discussions and definitions. David Clarke's critique of Rouse's interpretation of "attribute" is also noted (*Analytical Archaeology*, London: Methuen, 1968). The initial four chapters consider the elements of attribute, mode, artifact, artifact type, feature, association, and site. In "Chapter 1: An Interactional Theory of Artifact Description" (pp. 7-25, 53 figures, 9 tables), Krause notes that Rouse defined archaeology as the science of artifacts, with artifact as a concept with logical and epistemological priority. Krause differentiates between specimens, data, as well as the concept of mode (following Rouse's *Prehistory in Haiti: A Study in Method*, Yale University Publications in Anthropology No. 21, New Haven: Yale University Press, 1939). Other ideas are presented and defined: processes, linearity, feature, and bounded relationships. An artifacts is considered a material object conceptualized by the members of a social group as belonging to a category that is part of the cultural repertoire for that group" (Dwight Read 2007).

"Chapter 2. A Theory of Ceramic Production: The Focal Form" (pp. 26-48, 12 figures). Krause states that "all handmade pottery vessels are containers that partially enclose space" and then details ten morphological units in his theory of pottery vessel production (pp. 3-31). Five decorative units and four decorative forms are likewise elaborated. "Chapter 3. A Theory of Production Steps and Stages" (pp. 49-66, 5 figures). Multistage and multistep construction is divided into six production sequence units: obtain clay, prepare clay, build the vessel, decorate the vessel, dry the vessel, and fire the vessel. Each of these is further elaborated, but only mass modeling, slab/strap, coiling, and molding are considered. Three basic vessel fabrication procedures are reviewed beginning at the lip, shoulder, or bottom. Adding appendages includes a review of spouts handles, lugs, supports, and adornos. Drying and firing are discussed, the latter in terms of vaporizing residual moisture in the clay, burning the organic material in the clay, and vitrification (p. 58). Fuel types are barely mentioned, only a bonfire kiln stack is described and illustrated, but vessel positions are noted (mouth up or mouth down). Numerous other vessel forming, decorating, drying, and firing positions are not considered (see Rice 2015). Krause presents "A Theory of Ceramic Production" for pottery vessels as symbols within an equation (pp. 60-66). "Chapter 4. The Classification of Artifact Complexes: (pp. 67-77). He states that "when I was a graduate student, essay on classification irritated, confused, and bored me. Fifty years later they still do. Classification affects what we think and what we believe" (p. 67). He next discusses the management of three entities (objects, sounds, or ideas) and properties used in classification. There is a nice review of early taxonomic systems: Midwestern Taxonomic System (McKern 1939) focusing on aspects, phases, and patterns; Phase, Horizon and Tradition (Willey and Phillips 1962) with five stages: Lithic to Post- Classic; Midrange Integrative Taxon (Lehmer 1971); Three Ages (Rouse 1939, 1986): Lithic, Archaic, and Ceramic, the "stageonomy" of the West Indian sequence; and Cultural Historical Approach (Krause, p. 70). The Classification of Artifacts (pp. 73-77) follows Rouse's multisite, multicomplex classification: Age, Series, and Subseries. Also documented are Ford's (1936) pottery complexes (types and varieties); Lehner's (1951) ceramic wares; and

Krause's (1994) descriptive ware/type which considers clay selection and preparation, and basic manufacturing techniques. The use of "style" by Caribbean archaeologists is noted, and there is a review of Rouse's Saladoid Series of potteries.

"Chapter 5. Background for the Study of the Ceramic Sample from Paso del Indio" 78-88, 1 figure). The author presents a synopsis of the natural and archaeological backgrounds, and site history (1907-World War II and 1941-ff.). The narrative focuses on excavations beginning in 1993 and site chronology (2580 BC-AD 1655) based on 40 radiocarbon dates. There are two aceramic and 20 ceramic-bearing occupational layers. Sample selections were made from 32,658 sherds (equivalent to ca. 900-1100 pots) of porous, low-fired earthenware; laboratory procedures are also documented. "Chapter 6. The Paso del Indio Sample Size, Morphology, and Manufacture" (pp. 89-122, 16 figures, 4 tables). Only 54 sherds were sufficiently large to provide vessel shapes and sizes. Krause details Shouldered Vessels from Shoulderless Vessels in four sizes: Extra Large, Large, Medium, and Small. Based on antecedent knowledge, observations, and inferences, Krause next considers four variables: raw material acquisition, raw material preparation, construction technique, procedure of manufacture. He elaborates six construction procedures: bottom, lower body, shoulder, lower body, rim formation, and lip formation. Readers should pay close attention to the subsequent chapter: "Chapter 7. Modes of Appendation" (pp. 123-160, 13 figures, 1 table). Three appendage types are represented by one example: podal supports, annular skirt, and annular ring. There are 126 examples of handles, 47 lug forms (7 variants), and 45 kinds of adornos – each reviewed in detail. Adornos include human and anthropomorphic, composite zoomorphic, monkey head (?), bat, manatee, bird head, sea horse (?), and zoomorphic rim and lug effigies. "Chapter 8. Decoration, Drying, and Firing" (pp. 161-177, 6 figures, 4 tables). Decorative elements result in vessel surface modification including painting in red or pink pigments on 127 lip and 369 body sherds. Pigment locations (interior, exterior, or lip) and application methods are noted. However, there is no discussion as the how these colors were defined (e.g. no Munsell Color Chart determinations) and no chemical or other analytical analyses were conducted, and the designs are not further detailed. Tooling on vessel surfaces (incision, stab and drag, trail, and punctation) occurred in 24 instances and could be assigned to one of nine design classes. Vessel drying and firing are reviewed based on antecedent knowledge, observation, and/or inference. There is a speculative account of kiln construction and the presence of firing clouds *suggested* firing temperatures of 600-900°C. There is much additional information and clarity desired in this chapter narrative but quite a bit of that will be found in the subsequent summary.

"Chapter 9. Summary and Discussion" (pp. 178-197). Much additional information is included in this chapter and might have been incorporated into earlier chapters. For example, 32,658 ceramic vessel fragments were unevenly distributed through 20 systematically excavated strata; 73.6% of all specimens were general body fragments. On p. 89 Krause states that "fifty-four sherds are large enough to provide estimates of vessel shape and size" but on p. 179, among many other sherd tabulations, he states that there are "34 specimens large enough to provide accurate estimates…" He reports data suggesting that vessels were mostly coil-built and others slab-built with tempered clay (sand or grog) with no report of the use of grit, shell, or organics. He reviews construction strategies in creating four vessel size classes of round- and flat-bottomed pottery and the sizes and frequencies changed throughout the 20 ceramic levels. On p. 186 the reader learns that "Red or pink paint was applied to the surfaces of handles, lugs, and adornos as well as to vessel lips and bodies" and body paint locations are further detailed. Adornos, adorno subjects, and decorative elements are reviewed and some data elaborated; 4,124 lip forms are dominated by round direct (53%) or flat direct (22%). There is also a very useful study of the firing clouds. In the "Discussion" section (pp. 191-197), Krause notes (p. 191) that cultural classification was derived by Rouse "to classify archaeological cultures rather than isolated ceramic trait complexes"; see Rouse's *The Tainos: Rise and Decline of the People Who Greeted Columbus*, New Haven: Yale University Press, 1992, pp. 31-37). Krause proceeds to discuss two cultural series (Saladoid and Ostionoid) but it is unclear how subseries related to the series. Hence, Krause saw the need to organize his data onto series and subseries in order to use Rouse's logical and empirical cultural classification. He further states that "the relationship between subseries within a series must be one of multiple set intersections and defined by contrasting values and that subseries must have limited distribution in time and space than the series" (p. 192). Krause then comments that Caribbean archaeologists use the concept of "style' as a temporally and spatially restricted unit of classification. Lastly, he defines the Saladoid Series (pp. 193-194) which includes Cedrosan Saladoid Ware (300 BC-AD 800, but mostly 5^{th}-8^{th} c. AD), Cuevos Style Cedrosan Ware (11%), and Unnamed Cedrosan Saladoid Styles (89%). The Ostionoid Series (pp 195-197) includes Elenan Ostionoid Ware (8^{th}-12^{th} c. AD) and Chican Ostionoid Ware (12^{th}-14^{th} c AD) which, over time,

became simplified in appendation and decoration (14th-16th c. AD).

This book is not an "easy read" but there is much to be gained by carefully reading. It should especially be useful to Caribbean archaeologists interested in the manufacture, decoration, and classification of prehistoric pottery, as well as for archaeologists interested in the history of archaeological theory. Terms such as ceramic ethnoarchaeology, *chaîne opératoire*, and diachronic and synchronic don't appear in this work. There are detailed accounts of the production sequence, coil-building, and sample selection. I would have like to see additional, clarifying information on the radiocarbon dates (corrected?) and their relationship to the ceramic-bearing strata and how these relate to the series and subseries ceramics. There are only scattered references to sand and grog temper (p. 180) and mention of firing sherds to vitrification (p. 58) – these, likewise, need further explanation. Thin section and chemical analyses would be useful for defining the pottery while chemical studies on the decorative paints might reveal paint sources and other useful information. An assessment of vessel residues has apparently not been undertaken. There are a number of line drawings of the sherds but no actual photographic images. A few typographical mistakes escaped proof reading: p. 81: Mckusick = McKusick; p. 209: Bettie = Beattie; p. 214: Vacelus = Vacelius; and Wendi Ashmore (p. 9 and 209) should be Wendy Ashmore.

Prehistoric Pottery Across the Baltic: Regions, Influences and Methods. Paul Eklöv Pettersson (ed.), British Archaeological Reports International Series S-2785. Oxford: British Archaeological Reports, 2016. 80 pp., 71 figures, 3 tables. ISBN 978140731463 1. The 9 chapters (13 authors) derive from the "Pottery across the Baltic" conference held at Lund University, 7-9 March 2013, organized by Paul Eklöv Pettersson, Thomas Ericsson, and Anders Lindahl. The presentations were by authors whose modern countries border the Baltic Sea. The volume has a "Preface" (p. 1) and "List of Participants" (p. 2); each chapter has its own bibliography. The Baltic region is understudied and this volume helps to shed light on the area and its local ceramic production and metallurgy. A few minor typographical errors don't detract from the excellence of important new research. Experimental archaeology and vessel replication is reported and one study employs XRPD.

"Asbestos Ceramics along the West Norwegian Coast—Influences, Age and Morphology in the Bronze Age-Early Pre-Roman Iron Age" by Henrietta Maria Børslid Hop (University of Bergen), pp. 3-12, 6 figures, 2 tables, 47 references. The research Hop presents derives from her 2011 Master's thesis at Bergen University. She presents a brief outline of asbestos ceramics found in Norway as well as a summary of studies of Bronze Age ceramics in western Norway and previous studies of asbestos ceramics from southwestern Norway. Hop provides context and morphological information of 721 sherds from 22 settlements (none are from graves) including sherd thickness, tempers, and vessel shapes. Details are provided about South Scandinavian and northwest Norwegian asbestos ceramics, the latter influenced by the former ceramic tradition. "To Your Health or to Your Ancestors? A Study of Pottery in Graves from Eastern Norway in the Early Iron Age" by Christian Løchsen Rødserud (Museum of Cultural History, Norway), pp. 13-20, 7 figures, 71 references. The research presented here derives from Rødserud's 2012 doctoral thesis at the University of Oslo. Cremation urns were used during the Early Iron Age (500 BC-AD 575) in eastern Norway. Beginning with the Roman period complete sets of pottery vessels used for food and drink were buried in graves and glass and bronze vessels occurred in later burials. Rødserud uses a sample of 1,330 graves from eastern Norway; 1,263 of these had cooking ware and storage vessels that were coarse tempered and undecorated. The ceramics includes both local and imported wares that he hypothesizes had symbolic values and were used in feasting rituals.

"Use Traces on Crucibles and Tuyères? An Experiment in Ancient Metallurgy" by Katina Botwid and Paul Eklöv Pettersson (both Lund University), pp. 21-28, 15 figures, 18 references. Ceramic tools were used in metal casting during the Late Bronze Age in sites such as Brogården (a settlement with graves) and Pryssgården; melting crucibles were recovered from both. The authors undertook experimental archaeology by creating replicas of the crucibles and tuyère pipes using charcoal as fuel. "Visual temperatures" were measured by Munsell color comparisons and temperatures estimated at 1000-1100°C were attained. The replica copper alloy castings were compared to the archaeological specimens; heavy reduction, vitrification, and sintering were reported for the crucibles. "Ertebølle and Pitted Ware Culture? The Late Mesolithic and Neolithic Sites of Hamburg Boberg" by Laura Thielen and Britta Ramminger (both Hamburg University), pp. 29-38, 8 figures, 39 references. The authors focus on the Late Mesolithic and Neolithic (ca. 4500-3500 BC) at Hamburg Boberg area sites which have transitional pottery between Ertebølle and Funnel Beaker cultures indicative of a shift from hunting and gathering to farming. Site locations and the excavation in the 1950s and 1960s of three sites (# 13, 15 East, and 20) are

detailed. Relationships to Pitted Wares culture are reviewed and an analysis and summary of prior ceramic research and new interpretations of chronologies and site functions are proposed. "Containers of Meaning" by Alise Šulte (Latvia University), pp. 39-42, 4 figures, 10 references. The author provides a brief introduction to Couronian burial traditions which includes miniature pottery dating primarily to the fifth-ninth century AD and occasionally into the tenth century. In western Latvia graves and grave goods are rarely found in living sites. Miniatures often occur in child burials. The vessels are both hand and wheel-thrown, 4-10 cm in height, in varied shaped with open unrestricted mouths.

"Pottery Firing Without a Kiln – Hand-Built Pottery in the Territory of Present-Day Latvia in the Middle and Late Iron Age (5^{th}-12^{th} centuries AD)" by Baiba Dumpe, Agnese Stunda-Zujeva, and Jana Vecstaudža (Natural History Museum of Latvia), pp. 43-53, 11 figures, 22 references. Pottery dating to the Middle and Late Iron Age (fifth-twelfth century AD) in Latvia is characterized as hand-built "rusticated" vessels; some were smoothed with pinched walls. The earliest kilns and wheel-thrown ceramics date to the eleventh and twelfth centuries AD. The authors' research focuses on firing temperatures and firing process. Macroscopic and XRPD analysis of 43 ceramic specimens and clays from sites in the Gulf of Riga drainage is supplemented by experimental archaeology. Local clays contain large amounts of iron oxide with vessels fired in a reduction atmosphere to 700°C but usually to 800-900°C. XRPD difractograms are presented; sherd specimens typically have quartz particles and decomposed illite. Firing experiments on handmade specimens were fired in bonfires where temperatures of 600-700°C were reached easily. Short interval open firings of pots made with various tempers (sand, limestone pebbles, crush rock, bran, and chaff) reached 800-900°C. There are illustrations of cross-sections of the experimental specimens fired from 400-900°C.

"The Making of Tatinger Pitchers and Transmission of Technology" by Maggie Fredriksson and Thomas Erikson (Lund University), pp. 55-58, 2 figures, 1 table, 23 references. Tating or Tatinger pitchers were produced and distributed in the Rhineland during the second half of the eighth century AD and are associated with Christian missionization during the Viking Age. The authors provide background about the pitchers and focus on a vessel from Swedish chamber grave BJ 854 at Hemlanden, Birka, Uppland. The pitcher was wheel-thrown polished earthenware, oxidized in a kiln firing and decorated with a post-fired pattern with tin-foil applique using animal glue adhesive (tin has a melting point of 232°C). Experimental replication included the preparation of the foil for a "Christian" design (crosses) and application all of which required five hours. A variety of glues were tried and the contrast of black polished ceramic and shiny tin foil resulted in a novel type of decoration used during the Merovingian period.

"Suttung's Mead and Jugs with Tubular Handles in Sweden" by Thomas Eriksson ((Lund University), pp. 59-74, 15 figures, 53 references. A heterogeneous group of jugs with tubular handles dating ca, 100-600 AD was made in Northern and Central Europe but are very common on Gotland Island and the adjacent shores of the Baltic Sea. Prior functional interpretations are reviewed. This study focuses on Swedish material, decoration, local distribution, chronology, and contexts in graves in northwestern Europe. Eastern and western Scandinavian styles are noted. Vessel volumes (0.43-5.0 liters) were calculated and the relationships of vessel sizes and quantities of grave goods suggest that the higher volume containers are found in "richer" graves. Typological analysis resulted in the definition of 11 forms of which four were more common. Norse mythology and mead as a beverage are discussed in relationship to magical powers and rituals; the iconography on vessels included snakes, eagles, and geometric forms (triangles, deltoid, herringbone, zigzag, and waves). The calculation of volume capacities of a revolved solid is an interesting concept (URL p. 74). "Ceramic Evidence from Non-ferrous Metallurgy in the Mälaren Valley during the Viking Age" by Daniel Salhén (Stockholm University), pp. 75-80, 3 figures, 33 references. Research on non-ferrous (Cu and Ag alloys) metallurgy comes from the ongoing "Metalworking Crafts in Contexts" project. The Mälaren Valley is located in east-central Sweden on the Baltic coast. Fourteen sites included settlements, workshops, and grave complexes. Two sites, Birka and Sigtuna, were centers of metallurgical specialization; archaeological studies at these sites yielded 25,000 mold fragments and 10,000 crucible sherds. The casting of decorative items (brooches and pins) and some ingots are reported. Petrographic comparisons of the specimens proved to be inconclusive. Hearth structure data was ambiguous but the non-ferrous alloys were mostly associated with ferrous metallurgy. Tentative conclusions are presented but further comparative data is needed.

MARITIME ARCHAEOLOGY

Nicolás Ciarlo, Associate Editor

This issue presents an account of recent papers and books, past conference presentations and future meetings.

Recent Publications

International Journal of Nautical Archaeology. From *IJNA* 2017, Vol. 46, No. 1: "Cutwaters Before Rams: an experimental investigation into the origins and development of the waterline ram" (W. M. Murray et al.); "*Mars* (1564): the initial archaeological investigations of a great 16th-century Swedish warship" (N. Eriksson & J. Rönnby); "'They call 'im *Crowie*': an investigation of the Aboriginal significance attributed to a wrecked River Murray barge in South Australia" (A. Roberts et al.); and "The Search for the 1871 Whaling Fleet of the Western Arctic: writing the final chapter" (B. W. Barr et al.).

Journal of Archaeological Sciences. From *JAS* 2017 (up to June), Vol. 77: "Adaptations to sea level change and transitions to agriculture at Khao Toh Chong rockshelter, Peninsular Thailand" (B. Marwick et al.); Vol. 78: "Genetic studies on the prehispanic population buried in Punta Azul cave (El Hierro, Canary Islands)" (A. C. Ordóñez et al.); and "Least cost path analysis of early maritime movement on the Pacific Northwest Coast" (R. Gustas & K. Supernant); Vol. 79: "Ancient DNA analysis of cyprinid remains from the Mesolithic-Neolithic Danube Gorges reveals an extirpated fish species *Rutilus frisii* (Nordmann, 1840)" (I. Živaljević et al.); Vol. 80: "Methods for inferring oyster mariculture on Florida's Gulf Coast" (J. A. Jenkins); Vol. 81: "Use of space and site formation processes in a Neolithic lakeside settlement. Pollen and non-pollen palynomorphs spatial analysis in La Draga (Banyoles, NE Iberia)" (J. Revelles et al.); and Vol. 82: "Locating where archaeological sites occur in intertidal sequences: The use of archaeoentomological data as a proxy for tidal regime" (D. Smith).

Journal of Archaeological Sciences: Reports. From *JAS: Reports* 2017 (up to June), Vol. 11: "Challenges for microwear analysis of figurative shell ornaments from pre-Colonial Venezuela" (C. Guzzo Falci et al.); "Burnt bones by Europe's largest lake: Zooarchaeology of the Stone Age and Early Metal period hunter-gatherers at Lake Ladoga, NW Russia" (O. Seitsonen et al.); "Prehistoric diet and mortuary practices in the Jomon period: Isotopic evidence from human skeletal remains from the Yoshigo shell mound" (K. Kiriyama & S. Kusaka); "Further isotopic evidence for seaweed-eating sheep from Neolithic Orkney" (R. J. Schulting et al.); and "Sickly slaves, soldiers and sailors. Contextualising the Cape's 18th–19th century Green Point burials through isotope investigation" (L. Mbeki et al.); Vol. 12: "First analysis of ancient mtDNA genetic diversity in Northern coast of Argentinean Patagonia" (C. M. Crespo et al.); "Migration and integration on the Baltic island of Öland in the Iron Age" (H. Wilhelmson & T. D. Price); "Integrated methods for understanding and monitoring the loss of coastal archaeological sites: The case of Tochni-*Lakkia*, south-central Cyprus" (G. M. Andreou et al.); "The bigger the better? On sample volume and the representativeness of archaeobotanical data in waterlogged deposits" (F. Antolín et al.); "Complexities in the palaeoenvironmental and archaeological interpretation of isotopic analyses of the Mud Shell *Geloina erosa* (Lightfoot, 1786)" (R. W. Twaddle et al.); and "Shoreline reconstruction of the submerged Minoan harbour morphology in the bay of Kato Zakros (Eastern Crete, Greece)" (N. Mourtzas & E. Kolaiti); see also "Palaeoenvironmental implications of a marine geoarchaeological survey conducted in the SW Argosaronic gulf, Greece" (M. Geraga et al.) and other articles included in the Special Section on "Geoarchaeology of the Mediterranean islands" (M. Ghilardi & L. Lespez, eds.); and Vol. 13: "Combined geochemical and geochronological analyses of stone artefacts provide unambiguous evidence of intra- and inter-island interactions in Polynesia" (A. Hermann et al.); "Who resided in Ridanäs?: A study of mobility on a Viking Age trading port in Gotland, Sweden" (E. M. Peschel et al.); "Biogeochemical reconstructions of life histories as a method to assess regional interactions: Stable oxygen and radiogenic strontium isotopes and Late Intermediate Period mobility on the Central Peruvian Coast" (S. J. Marsteller et al.); "Obsidian in archaeological sites on Mocha Island, southern Chile: Implications of its provenience" (R. Campbell et al.); "The importance of freshwater fish in Early Holocene subsistence: Exemplified with the human colonization of the island of Gotland in the Baltic basin" (A. Boethius et al.); "Geoarchaeology of Portus Mareoticus: Ancient Alexandria's lake harbour (Nile Delta, Egypt)" (C. Flaux et al.); and "'Hartnell's time machine' reprise: Further implications of zinc, lead and copper in the thumbnail of a Franklin expedition crewmember" (K. Millar & A. W. Bowman).

Quaternary International. From Vol. 427, Part A: "Shape as an outcome of formation history: Terrestrial Laser Scanning of shell mounds from far north Queensland, Australia" (B. P. Larsen et al.); "Isolating downward displacement: The solutions and challenges of amino acid racemisation in shell midden archaeology" (B. Koppel et al.); "Isotopic composition of *Conomurex fasciatus* shells as an environmental proxy for the Red Sea" (N. Hausmann et al.); and "Reconciling oxygen isotope sclerochronology with interpretations of millennia of seasonal shellfish collection on the Pacific Northwest Coast" (A. Cannon & M. Burchel); among other papers published in the special issue "Current methodological

issues in archaeomalacological studies" (A. Jerardino, P. Faulkner & C. Flores, eds.); Vol. 429, Part A: "Encircled in water: Modelling watercourses of the late Neolithic – early Copper Age Vinča culture sites in the Danube region (c. 5300 – 4500 BC)" (M. Marić); Vol. 431, Part B: "Seaward dispersals to the NE Mediterranean islands in the Pleistocene. The lithic evidence in retrospect" (Ch. Papoulia); and "Paleoenvironmental investigations, chemical analysis and characterization of underwater strata of Marigondon Cave" (C. Rocha et al.); Vol. 435, Part B: "From virtual survey to real prospection: Kawésqar mobility in the Fuego-Patagonia seascape across terrestrial passages" (A. Maximiano Castillejo); Vol. 436, Part A: "Late Holocene shorelines in east Attica (Greece)" (N. Evelpidou et al.); Vol. 438, Part A: "The coastal ridge sequence at Rio Grande do Sul: A new geoarchive for past climate events of the Atlantic coast of southern Brazil since the mid Holocene" (J. P. Milana et al.); Vol. 438, Part B: "Middle Stone Age inhabitants of the southwestern Cape and northern KwaZulu-Natal, South Africa" (K. Kyriacou); Vol. 439, Part A: "Quaternary coastal and marine studies in Central Mediterranean" (F. Antonioli et al.); "Lagoonal settlements and relative sea level during Bronze Age in Northern Adriatic: Geoarchaeological evidence and paleogeographic constraints" (A. Fontana et al.); "The so called 'Herodotus Springs' at 'Keri Lake' in Zakynthos Island western Greece: A palaeoenvironmental and palaeoecological approach" (P. Avramidis et al.); "Numerical approach to the study of coastal boulders: The case of Martigues, Marseille, France" (A. Piscitelli et al.); "Evidence of relative sea level rise along the coasts of central Apulia (Italy) during the late Holocene via maritime archaeological indicators" (G. Mastronuzzi et al.); "Benthic foraminifera as indicators of relative sea-level fluctuations: Paleoenvironmental and paleoclimatic reconstruction of a Holocene marine succession (Calabria, south-eastern Tyrrhenian Sea)" (C. Cosentino et al.); and "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.); along with other remarkable papers of the special issue "Quaternary coastal and marine studies in Central Mediterranean" (M. Anzidei, D. Casalbore, V. Lo Presti & F. Antonioli, eds.); finally, Vol. 440, Part A and Vol. 441, Part A: a double dossier which contains several presentations on the topic "Environmental and Climatic Changes Inferred from Sedimentary Records on Asian Shelf Margins" (Y.-P. Chang, X. Liu & R. Xiang, eds.).

The following articles published in journals on Archaeology-related topics up to June 2017 are worth mentioning: ***Antiquity***, Vol. 91, No. 355: "Assembling places and persons: a tenth-century Viking boat burial from Swordle Bay on the Ardnamurchan peninsula, western Scotland" (O. J. T. Harris et al.); and "The provenance, date and significance of a Cook-voyage Polynesian sculpture" (N. Thomas et al.); and Vol. 91, No. 356: "Maritime hominin dispersals in the Pleistocene: advancing the debate" (T. P. Leppard & C. Runnels); ***Archaeological and Anthropological Sciences***, Vol. 9, No. 3: "The Dor C shipwreck, Israel: metallurgical analysis and its contribution to the ship characterization" (D. Ashkenazi et al.); ***Archaeometry***, Vol. 59, No. 3: "New Insights into the Provenance of the Obsidian Fragments of the Island of Ustica (Palermo, Sicily)" (F. Foresta Martin et al.); ***Geoarchaeology***, Vol. 32, No. 2: "Long-Term Interactions between the Roman City of Ostia and Its Paleomeander, Tiber Delta, Italy" (F. Salomon et al.); and "Multiple Reoccupations after Four Paleotsunami Inundations (0.3–1.3 ka) at a Prehistoric Site in the Netarts Littoral Cell, Northern Oregon Coast, USA" (R. Minor & C. D. Peterson); and Vol. 32, No. 3: "A Geochemical Signal from a Mesolithic Intertidal Archaeological Site: A Proof-of-Concept Study from Clachan Harbor, Scotland" (Ł. Mikołajczyk & J. E. Schofield); ***Journal of Anthropological Archaeology***, Vol. 45: "Large mammal biomass predicts the changing distribution of hunter-gatherer settlements in mid-late Holocene Alaska" (A. H. Tremayne & B. Winterhalder); ***Journal of Cultural Heritage***, Vol. 23 (Supplement): "Geoarchaeological remote sensing survey for cultural heritage management. Case study from Byblos (Jbail, Lebanon)" (J.-P. Deroin et al.); Vol. 24: "Seafloor analysis and understanding for underwater archeology" (M. Reggiannini & O. Salvetti); and Vol. 25: "Application of methyltrimethoxysilane to increase dimensional stability of waterlogged wood" (M. Broda & B. Mazela); ***Journal of Maritime Archaeology***, Vol. 12, No. 1: "Review: Rusticle Formation on the *RMS Titanic* and the Potential Influence of Oceanography" (M. Salazar & B. Little); ***Papers from the Institute of Archaeology***, Vol. 27, No. 1: "Shells and Humans: Molluscs and Other Coastal Resources from the Earliest Human Occupations at the Mesolithic Shell Midden of El Mazo (Asturias, Northern Spain)" (A. García-Escárzaga et al.); ***Quaternary Science Reviews***, Vol. 155: "Archaeological implications of a widespread 13th Century tephra marker across the central Indonesian Archipelago" (B. V. Alloway et al.); and Vol. 168: "Early human occupation of a maritime desert, Barrow Island, North-West Australia" (P. Veth et al.); ***STAR: Science & Technology of Archaeological Research***, Vol. 3, No. 1: "The influence of varying proportions of terrestrial and marine dietary protein on the stable carbon-isotope compositions of pig tissues from a controlled feeding experiment" (E. C. Webb et al.); and ***The Journal of Island and Coastal***

Archaeology, Vol. 12, No. 1: see articles, dedicated to archaeological research conducted at coastal deserts in Australia, South Africa, and Patagonia published in this special issue; and Vol. 12, No. 2: "Evaluating Ancient Whale Exploitation on the Northern Oregon Coast Through Ancient DNA and Zooarchaeological Analysis" (H. P. Wellman et al.); and "Settlements and Seafaring: Reflections on the Integration of Boats and Settlements Among Marine Foragers in Early Mesolithic Norway and the Yámana of Tierra del Fuego" (H. B. Bjerck).

Other non-archaeological publications also present exciting results based on the application of archaeometric techniques: ***Continental Shelf Research***, Vol. 134: "Palaeoshorelines on the Australian continental shelf: Morphology, sea-level relationship and applications to environmental management and archaeology" (B. P. Brooke et al.); ***Information Systems***, Vol. 65: "A survey of official online sources of high-quality free-of-charge geospatial data for maritime geographic information systems applications" (Ch. Kalyvas et al.); ***Journal of Electronic Imaging***, Vol. 26, No. 1: "Underwater reflectance transformation imaging: a technology for *in situ* underwater cultural heritage object-level recording" (D. Selmo et al.); ***Journal of Field Robotics***, Vol. 34, No. 4: "High-Resolution Underwater Robotic Vision-Based Mapping and Three-Dimensional Reconstruction for Archaeology (M. Johnson-Roberson et al.); ***Marine Geology***, Vol. 385: "Late Holocene erosion of the Canopic promontory (Nile Delta, Egypt)" (C. Flaux et al.); ***Palaeogeography, Palaeoclimatology, Palaeoecology***, Vol. 466: "In search of *Pollentia*'s southern harbour: Geoarchaeological evidence from the Bay of Alcúdia (Mallorca, Spain)" (M. Giaime et al.); Vol. 468: "Holocene hydrological events and human induced environmental changes reflected in a southeastern Mediterranean fluvial archive" (S. Avnaim-Katav et al.); and Vol. 470: "Last interglacial sea level high-stand deduced from well-preserved abrasive notches exposed on the Galilee coast of northern Israel" (G. Sisma-Ventura et al.); ***Proceedings of the Geologists' Association***, Vol. 128, No. 2: "Late Holocene coastal-plain evolution of the Netherlands: the role of natural preconditions in human-induced sea ingressions" (H. J. Pierik et al.); ***Progress in Organic Coatings***, Vol. 104: "Antifouling coatings for underwater archaeological stone materials" (S. A. Ruffolo et al.); ***Thermochimica Acta***, Vol. 653: "Quantitative study on the sealing material of 600 years ago" (X. Yu et al.); finally, from ***Underwater Technology***, Vol. 34, No. 2: "Detecting the Ma'agan Mikhael B shipwreck" (D. Cvikel et al.).

Applied Underwater Acoustics (T. Herbert Neighbors & D. Bradley, eds.), ISBN 9780128112403. This book contains essential information on underwater acoustics for scientific and professional practice. Currently available applications to underwater archaeology, as well as to other fields of research, are presented in Chapter 14 "Underwater Acoustic Measurements and Their Applications" (L. Bjørnø).

British Archaeological Reports (BAR). The following book published in the late 2016 by Archaeopress is of particular interest: "Disponibilidad y explotación de materias primas líticas en la costa de Norpatagonia (Argentina)" (J. Alberti), South American Archaeology Series No. 27, ISBN 9781784914806. This doctoral research of the University of Buenos Aires studies the lithic technology of human groups that inhabited the coast of San Matías gulf (Province of Río Negro, Argentina) from middle to late Holocene. Based on a collection of different raw materials recovered at the surface from sites along the Atlantic coast, an investigation on how these rocks were selected, shaped and finally discarded was performed. This work stands as a valuable contribution for the knowledge of past hunter-gatherer technology. A special appendix is dedicated to the petrographic thin-section assessment of different rock types.

Coastal Research Library. The Series book: *Under the Sea: Archaeology and Palaeolandscapes of the Continental Shelf*, edited by G. N. Bailey, J. Harff & D. Sakellariou, ISBN 9783319531588, compile a selection of papers from a conference held at the University of Szczecin in September 2013. They cover different themes addressed between 2009 and 2013 during the activities of the research network SPLASHCOS (Submerged Prehistoric Archaeology and Landscapes of the Continental Shelf). The following chapters can be highlighted: Archaeology and Palaeolandscapes of the Continental Shelf: An Introduction" (G. N. Bailey et al.); "Survey Strategies and Techniques in Underwater Geoarchaeological Research: An Overview with Emphasis on Prehistoric Sites" (T. Missiaen et al.); "Relative Sea Level Rise, Palaeotopography and Transgression Velocity on the Continental Shelf" (F. Latino Chiocci et al.); "Submerged Pottery Neolithic Settlements off the Coast of Israel: Subsistence, Material Culture and the Development of Separate Burial Grounds" (E. Galili et al.); "Fished up from the Baltic Sea: A New Ertebølle Site near Stohl Cliff, Kiel Bay, Germany" (J. Goldhammer & S. Hartz); "Early Holocene Landscape Development and Baltic Sea History Based on High-Resolution Bathymetry and Lagoonal Sediments in the Hanö Bay, Southern Sweden" (A. Hansson et al.); "Sacred Landscapes and Changing Sea Levels: New Interdisciplinary Data from the Early Neolithic to the Present in South-Eastern Sicily" (G. Scicchitano et al.);

and "Aegean Pleistocene Landscapes Above and Below Sea-Level: Palaeogeographic Reconstruction and Hominin Dispersals" (D. Sakellariou & N. Galanidou).

Mediterranean Connections. *Maritime Transport Containers and Seaborne Trade in the Bronze and Early Iron Ages* (A. B. Knapp & S. Demesticha), ISBN 9781629583549. This book focuses on the origin and development of maritime transport containers (MTC) from the Early Bronze through the Early Iron Age periods (ca. 3200–700 BC). Analyzing this category of objects broadens our understanding of ancient Mediterranean interregional connections, including the role that shipwrecks, seafaring, and coastal communities played in interaction and exchange. These containers have often been the subject of specific and detailed pottery studies, but have seldom been examined in the context of connectivity and trade in the Aegean and eastern Mediterranean. The appendix dedicated to the volumetric analysis and capacity measurements of selected MTCs (S. Demesticha) is worth further reading.

Vertebrate Paleobiology and Paleoanthropology. The Series book: *Climate Change and Human Responses. A Zooarchaeological Perspective*, edited by G. Monks, ISBN 9789402411058, deals with the ways in which human populations responded to climatic and environmental change through time, and the information that can nowadays be obtained from animal remains at archaeological sites around the globe. Among other chapters, the following are worth mentioning: "Oxygen Isotope Seasonality Determinations of Marsh Clam Shells from Prehistoric Shell Middens in Nicaragua" (A. C. Colonese et al); and "Evidence of Changing Climate and Subsistence Strategies Among the Nuu-chah-nulth of Canada's West Coast" (G. G. Monks).

When the Land Meets the Sea. The ACUA & SHA Series book: *Formation Processes of Maritime Archaeological Landscapes*, edited by A. Caporaso, ISBN 9783319487861, addresses a theme of particular interest for the understanding of coastal and underwater archaeological sites and maritime landscapes: anthropogenic and taphonomic processes that affect their formation through time. Works of this edited volume are based on an interdisciplinary perspective, which combines information from fields such as engineering, oceanography, and marine biology. Among other valuable chapters, the following are worth mentioning: "A Dynamic Processual Maritime Archaeological Landscape Formation Model" (A. Caporaso); "The Formation of a West African Maritime Seascape: Atlantic Trade, Shipwrecks, and Formation Processes on the Coast of Ghana" (R. Horlings & G. Cook); "Coastal Erosion and Archaeological Site Formation Processes on Santa Rosa Island, California" (Ch. S. Jazwa); and "Formation Processes of Maritime Archaeological Sites in Guadeloupe (French West Indies): A First Approach" (J.-S. Guibert et al.).

Previous Meetings and Conferences

50th Annual Conference on Historical and Underwater Archaeology. *Advancing Frontiers: Where the Next 50 Years of SHA Begins*. This meeting was held from 4th to 8th January 2017, at the Omni Fort Worth Hotel in Texas. Papers focused on archaeometric applications for the study and conservation of shipwreck remains are highlighted below.

From Symposium No. 4 – Setbacks and Solutions Within Archaeology (Chair: D. A. Haddock): "Chemical Mapping in Marine Archaeology: Defining Site Characteristics from Passive Environmental Sensors" (E. Swanson); Symposium No. 12 – Current Projects at the Conservation Research Laboratory at Texas A&M Univerisity (Chairs: D. Hamilton & Ch. Dostal): "The Conservation of the *Brother Jonathan* Chest" (K. Dollarhide); Symposium No. 20 – South Florida Shipwreck Research and Advancing Frontiers (Chair: J. Mckinnon): "Virtual Shipwrecks; Photogrammetry and User Interface Design in Archaeological Outreach" (S. C. Cox); "Reconstructing the Pillar Dollar Wreck" (D. L Sprague); and "3D Printing an Archaeological Site Map: Photogrammetric Recording and Printing of the Pillar Dollar Wreck" (A. E. Wright); Symposium No. 23 – The Tristan de Luna Shipwrecks and Settlement (1559-1561) in Pensacola, Florida (Chair: E. D. Benchley): "Analysis Of Amidships On The Emanuel Point II Shipwreck" (Ch. D. Bendig); and "Investigations on a Vessel from Luna's 1559 Fleet and Survey for Additional Ships" (G. D. Cook); Symposium No. 31 – The Application of Traditional and Innovative Documentation Techniques in Nautical Archaeology (Chair: Ch. Dostal): "Documenting and Reconstructing the Hull Remains of *Queen Anne's Revenge*" (A. Dempsey); "The 3D Digitization of the World Trade Center Wreck" (Ch. Dostal); "Lake Champlain's Steamboat *Phoenix* II: Mixing New and Traditional Underwater Archaeological Methods for Reconstruction" (C. Kennedy); and "Ship Scanners II: This Time, It's Technical" (Ch. P. Morris & J. Crider).

From General session No. 4 – Environmental Impacts and Conservation in Underwater Archaeology (Chair: M. Damour): "Deepwater Shipwrecks and Oil Spill Impacts: An Innovative Multiscalar Approach from Microbial Ecology to 3D Scanning Systems" (M. Damour et al.); "Casualties, Corrosion, and Climate Change: USS *Arizona* and Potentially Polluting Shipwrecks" (J.

Wright); and "Modeling Change: Quantifying Metal Shipwreck Degradation in Lake Michigan, Part II" (C. Zant); General session No. 6 – Collaborative Efforts and Public Interaction in Underwater Archaeology (Chair: W. Van Duivenvoorde): "The Goodwin Sands: Patterns of Burial and Updating the Wreck Record" (E. Krueger & J. Dix); General session No. 19 – Technological Advances in Underwater Archaeology (Chair: J. C. Bright): "3D in the Toolbox: An Operational Comparison of Acoustic, Photogrammetric, and Laser Scanning Methodologies Tested at Thunder Bay National Marine Sanctuary in 2016" (J. C. Bright); "Are ROVs The New VIP?: Developing A Supplemental Method For Recording Shipwrecks" (K. Clevenger); and "Espionage And United Fruit: An Analysis of the SS *San Pablo* Using 3-D Modeling And Photogrametry" (S. Hood); finally, from posters section: "Tracking The Shipwreck Trails Of Time" (T. Ball); "Explosion aboard Steamer USS *Tulip*: Site Investigations and Management of a Union Gunboat Wreck of the American Civil War" (G. R. Schwarz); "Cleaning Submerged Artillery: Tools and Methods Used to Conserve Cannon from Blackbeard's Flagship *Queen Anne's Revenge* (1718)" (E. Farrell & J. Borrelli); and "3D Printing for Submerged Heritage: A Comparative Study in Structured Light and Photogrammetry" (A. E. Wright).

Archeologia Subacquea 2.0 (V Convegno Nazionale di Archeologia Subacquea). This meeting was held at the Palazzo Garzolini di Toppo-Wassermann, University of Udine, Italy, from 8 to 10 September 2016. The following papers are worth mentioning: "Tecnologie e archeologia subacquea. Strumenti al servizio della conoscenza, tutela e valorizzazione del patrimonio culturale subacqueo" (M. Secci); "Materiali e strumenti innovativi per il restauro e la conservazione in situ del patrimonio archeologico subacqueo" (F. Bruno et al.); "Nuove tecnologie per la documentazione e la valorizzazione dei siti archeologici subacquei: il caso studio del Relitto "Punta Scifo D" (Crotone)" (F. Bruno et al.); "Dendrocronologia e archeologia subacquea in Italia: situazione e prospettive" (N. Martinelli); among others. For further information, see: http://asud.uniud.it/

International Congress on Underwater Archaeology – IKUWA 6. This meeting took place from 28th November to 2nd December at the Western Australian Maritime Museum, Fremantle, Australia. Presentations covered a wide range of themes, including digitization techniques, the *in situ* preservation and conservation of sites, the application of new technologies for the study of shipwrecks, and the geoarchaeology of harbours; among others. For instance, the following papers can be mentioned: "3DMAPPR: a community-based underwater archaeological photogrammetry program in Perth, Western Australia (N. Bigourdan & K. Edwards); "A proposed method to create a local coordinate system for underwater photogrammetric recording" (K. Yamafune et al.); "High-resolution digital recording techniques and taphonomic trajectories: multi-imaged photogrammetry applied to a drowned Late Pleistocene site in Central Chile (32°S)" (I. Cartajena et al.); "Research of the 17th-century 'Glass Wreck' using photogrammetric 3D documentation. The 'virtual open-air museum of wrecks in the Gulf of Gdansk' project" (T. Bednarz); "The role of 3D models in the interpretation and *in-situ* preservation of archaeological heritage: the case studies of Portus Iulius in submerged Baiae (Pozzuoli, Naples), and the ancient harbour in Marina Lunga-Sottomonastero (Lipari)" (B. Davidde Petriaggi et al.); "Verification of the *Batavia* reconstruction based on underwater photogrammetry and laser scanning" (P. Helmholz et al.); "Erosion and archaeological heritage – protection in Lake Constance and Lake Zurich (Central Europe)" (B. Eberschweiler); "*In-situ* preservation of the *James Matthews*: past, present and future" (V. Richards & P. Veth); "*In-situ* preservation and monitoring of a wooden shipwreck found in an intertidal zone, South Korea" (M. Y. Cha); "Integrated approach using sub-bottom profiler combined with sonar multi-beam as a preventive archaeological diagnosis before harbour extension" (P. Pelgas & L. F. Yann); "Sensing tidal landscapes: artificial intelligence and computer vision methods for underwater archaeological heritage in shallow waters" (A. Traviglia); "Integrating legacy excavation survey data with new technologies – the *James Matthews* experience" (T. Winton); "Helping to identify historic shipwrecks. The DNA analysis of ivory" (M. Coghlan & J. Green); "The legacy of the *Batavia* – new research on Beacon island: graves, bones and isotopes" (D. Franklin & E. Smits); "Geoarchaeological reconnaissance of Unguja Ukuu, a Late Holocene/Early Islamic trade port in southern Zanzibar" (N. Kourampas et al.); "There's a pier buried under there: rapid geomorphic and anthropogenic change along the Victorian coastline" (G. Hewitt et al.); and "New geoarchaeological results from the Greco-Roman port of Berenike Troglodytica on the Red Sea coast of Egypt" (A. M. Kotarba-Morley).

Other intriguing papers focused on 3D mapping and modeling of underwater archaeological sites and artifacts were presented in 2017 at the *3rd International Conference on Control, Automation and Robotics (ICCAR)*, 22nd to 24th April, Nagaya, Japan, in particular "Evaluation of underwater 3D reconstruction methods for Archaeological Objects: Case study of Anchor at Mediterranean Sea" (Y. Onmek et al.); and at the *3D Virtual Reconstruction and Visualization of Complex*

Architectures, 1st to 3rd March, Nafplio, Greece, such as "Virtual diving in the underwater archaeological site of Cala Minnola" (F. Bruno et al.); "Surveying the underwater archaeological site of Cape Glaros at Pagasetikos Gulf" (E. Diamanti et al.); and "3D modeling and mapping for virtual exploration of underwater archaeology assets" (F. Liarokapis et al.).

Call for papers

3rd Asia-Pacific Regional Conference on Underwater Cultural Heritage (APCONF). *The Maritime Cultural Landscapes and Seascapes of Asia-Pacific: Voyaging, Migration, Colonisation, Trade, and Cross-Cultural Contacts*. This meeting will be held from 27th November to 2nd December 2017, at the Hong Kong Maritime Museum (Major Sponsor and Venue Partner). It will address current management and protection strategies applied to underwater cultural heritage in Asia and the countries of the Indian and Pacific Oceans. The following sub-themes can be highlighted: Maritime Cultural Landscapes and Seascapes: Interdisciplinary Approaches; Museums, Public Outreach and Conservation; Technological Approaches to Underwater Cultural Heritage and Maritime Archaeology; and Nautical Technology in Asia-Pacific. Further information about *3rd APCONF* can be found in www.apconf.org, or by emailing Dr Bill Jeffery to billfjeffery@gmail.com. College of Liberal Arts and Social Sciences, University of Guam, UoG Station, Mangilao, Guam, 96923, USA, Tel: 16714831630.

Among other meetings that will be held in 2017, the following are of special interest: *3rd Acoustics in Underwater Geosciences Symposium* (RIO Acoustics 2017), Brazilian Geological Survey – CPRM, Rio de Janeiro, Brazil, from 25th to 27th July (see http://www.rioacoustics.org/); *18th ICOM-CC Triennial Conference*, Tivoli Congress Center & Hotel, Copenhagen, Denmark, from 4th to 8th September (see http://www.icom-cc.org/); and *International Congress of Maritime Museums 2017*, National Maritime Museum, Valparaiso, Chile, from 15th to 20th October (see https://icmmonline.org/).

REMOTE SENSING AND PROSPECTION

Apostolos Sarris, Associate Editor

"MedSTACH": Eastern Mediterranean Science and Technology Centre of Excellence for Archaeology and Cultural Heritage. The Eastern Mediterranean area hosts the vestiges of major ancient cultures that have shaped the formation of modern European societies. Situated in the heart of Eastern Mediterranean, Cyprus formally constitutes the easternmost part of federal Europe, and an easternmost repository and steward of European heritage. Due to its unique geographical position, Cyprus has always been a crossroad between Europe, Africa and Asia, and a bridge between their respective cultures and civilizations; this geographical characteristic is heavily reflected on the rich and diverse cultural heritage (CH) of the island. Cyprus's strategic position in the Eastern Mediterranean offers a unique opportunity to host a Science and Technology Centre of Excellence dedicated to archaeology and CH.

Project **MedSTACH** aims to establish Cyprus as an excellence hub in archaeology and cultural heritage in the Eastern Mediterranean region, capitalizing on multidisciplinary research and technological innovation. To this end, key Cypriot public academic institutions and national policy makers and stakeholders are teaming up with leading international research and academic institutions to lay the groundwork towards creating the Eastern Mediterranean Science and Technology Centre of Excellence for Archaeology and Cultural Heritage (acronym MedSTACH). More precisely, the **MedSTACH** consortium is coordinated by the Department of Civil Engineering and Geomatics of the Cyprus University of Technology and includes the Archaeological Research Unit of the University of Cyprus, the Department of Antiquities of Cyprus -- the national stakeholder and policy maker responsible for cultural heritage management on the island, and the Cyprus Tourism Organisation -- the national stakeholder an policy maker responsible for the promotion of Cyprus's touristic product. The consortium also includes as key international partners the Institute of Archaeology of the University College London (UCL), and the Laboratory of Geophysical-Satellite Remote Sensing and Archaeo-environment of the Foundation for Research and Technology – Hellas (FORTH).

MedSTACH's vision is the development of the necessary scientific and technological environment for advancing the state-of-the-art in archaeology and CH research in Cyprus, the Eastern Mediterranean region and beyond; this will be accomplished by strengthening regional wellsprings of scientific and technological expertise, capacity for innovation, and synergies among related Science, Engineering and Technology disciplines. The Centre also aims to transform the way archaeologists, allied researchers, CH professionals and all relevant stakeholders handle geospatial and other relevant digital information, in an effort to modernize archaeological research and fully exploit the region's unique cultural capital. Last, the Centre aspires to become a research

excellence hub for archaeologists working in the broader Eastern Mediterranean region for the promotion and protection of regional CH, as well as a key facilitator for the establishment of related synergies among neighboring Mediterranean countries.

MedSTACH includes four (4) interconnected key research domains, namely, Heritage Exploration, Spatial Analysis, Heritage Protection and Material Characterisation, as well as a supporting Heritage Information and Communication Technologies (ICT) Unit. Heritage Exploration encompasses innovative, targeted use of geophysical, remote sensing and related technologies for a variety of applications related to archaeological exploration, mainly focused on the detection/identification of areas bearing archaeological interest, not yet excavated. Spatial Analysis encompasses geoinformation, geoanalytics and geocomputation, in order to better understand the role of artefacts, sites and landscapes within their unique context and their role and position within the socio-economic environment in different time periods. Heritage Protection involves detailed study, analysis and monitoring of standing monuments and sites via non-contact and/or lab analyses, as well as systematic studies on the effects of environmental and anthropogenic factors, e.g., natural hazards or air pollution, on exposed CH monuments and sites. Material Characterization aims at enhancing scientific knowledge about the materials, techniques, tools and technological know-how involved in the construction and manufacturing of archaeological artifacts. The Heritage ICT Unit will constitute the technical backbone for the Centre, both in terms of data used for conducting research, as well as in terms of services and products for the scientific community and broader public (e.g. digitization and database management, ontologies and metadata creation, digital archiving, web services). The methodologies, procedures, and services developed within **MedSTACH** will be continuously disseminated in the public and private sectors, and are expected to have a positive impact on tourism, thus stimulating local and regional sustainable economic growth.

The **MedSTACH** proposal was ranked 1st (attaining full marks 15/15, "Excellent") on a pan-European scale, among 208 proposals submitted to Programme "Teaming for Excellence" Phase 1, part of European Union's (EU) Horizon 2020 framework for Research and Innovation. Programme "Teaming for Excellence" (Teaming) aims at connecting, via the creation of new or the major upgrade of existing Centers of Excellence, renowned research institutions from countries with a strong tradition in Research and Innovation with institutions from countries with developing research activity, so that the latter countries become more competitive in securing research funds. The **MedSTACH** proposal was awarded 0.4 million euros for a period of one year (Phase 1 of the Programme) in order to develop a business plan for the **MedSTACH** Centre of Excellence. That business plan will be submitted for evaluation to the EU during Phase 2 of the Teaming Programme, seeking funding of 15 million euros for a period of 5-7 years, with the possibility of an additional equal amount of national co-funding for a period of 15 years. Phase 1 objectives aim to take advantage of the Teaming framework to lay the groundwork beneath the establishment of the **MedSTACH** centre. Phase 2 objectives aim to build upon the future Centre's capabilities and materialize its research and innovation potential at the local, regional and European level.

The ***Interactions between Soil Science and Geophysics in Archaeological Prospection (ISSGAP) Network*** hold their second workshop at the GeoSatReSeArch Laboratory of FORTH in Rethymno June 5th - 7th, 2017. This network of archaeologists and geoscientists was formed following a workshop in 2015 in Rethymno. The purpose of the network is to discuss in depth some emergent ideas about the points of interaction between geomorphology, geoarchaeology, geochemistry, geophysics and environmental studies in Archaeology. Since the studies of Scollar, Clark and Weston, back in the early stages of the discipline of archaeo-geophysics, little progress has been made in the understanding of the relationships between soil properties and geophysical results. One of the consequences of this gap in knowledge is that our abilities to interpret geophysical datasets are still very limited. This deficiency prevents geophysical survey moving beyond basic prospection in archaeology and becoming a significant tool for answering nuanced questions about archaeology and landscapes. Whilst the research community has acknowledged this issue, resolving it requires cross disciplinary collaboration and so there have been very few research projects that have focused on this topic. Likewise, there have not been any scholarly discussions devoted to consider and structure the achievements of these projects.
The objective of the network (and the workshops it holds) is to bring together key researchers working on the integration of soil analysis and archaeo-geophysics. During the first workshop, the panel discussed the outcomes of past and on-going projects. Based on these experiences, the panel also formulated observations and recommendations relating to:

- The type of research questions that a combined approach may be able to answer in archaeological studies

- Potential methodological challenges
- The role of such integrated strategies in the development of the discipline of archaeo-geophysics

Following the first workshop, the network began recruiting interested scientists, and an online discussion forum was created. They can be reached at issgapnetwork@gmail.com.The second workshop will address the publication of papers from the first workshop in a special edition of Archaeological Prospection and will explore ideas about achieving some of the key priorities identified in 2015: interdisciplinary collaborations and training events. Whatever the case it seems that the topic is of crucial need in order to understand the dynamics between the geophysical results (and even aerial photography and satellite imagery) and the soil conditions and more has to be done in various domains, from the creation of libraries of geophysical signals in various soil contexts to long term experimental monitoring.

Please contact the network at issgapnetwork@gmail.com if you are interested in participating in future events or would like to be added to the email discussion group.

Kayt Armstrong, Department of Archaeology, Durham University
Carmen Cuneca-Garcia, Department of Archaeology and Cultural History, Norwegian University of Science and Technology
Ian Moffat, Department of Archaeology, Flinders University

Unlocking Sacred Landscapes (UnSaLa) Network. Religious and social lives in antiquity are closely associated. While we need to recognise that we cannot completely enter the minds of the people of the past, at the same time we have to acknowledge and discuss the importance of the sacred element. Religion was the very means by which ancient people usually made sense of their societies and of their world as they experienced it. The study of material or data which is directly religious in character, therefore, need not be limited to a contemplation of the metaphysical, but it can provide valuable insights into the wider socio-political milieu. Underpinning the archaeology of ritual and religion includes proceeding to a more inclusive approach and the notion of placing them within a broader landscape and social framework.

Emphasising this function of religion in a Cypriot context is exactly what the initial project of this network aimed to do: to 'unlock' sacred landscapes and religion, by inserting them in their social context and their own *longue durée*, having no constrains in using all the possible methods – being called 'culture-historical', 'processual' or 'post-processual' – in order to achieve the best possible holistic approach.

Unlocking Sacred Landscapes (UnSaLa) has recently been awarded further funding and support from the Irish Research Council, the Trinity Long Room Hub Arts & Humanities Research Institute, the Anastasios A.G. Leventis Foundation, and the Society for Promotion of Hellenic Studies to establish this international network, concerned with the diachronic study of the temporality, spatiality and materiality of Mediterranean sacred landscapes in general. The function of the Network is based on an agreement of collaboration between the Department of Classics of Trinity College Dublin, the Laboratory of Geophysical-Satellite Remote Sensing and Archaeo-environment (GeoSat ReSeArch Lab) of the Foundation for Research and Technology, Hellas (FORTH) in Crete, Greece, and the Archaeological Research Unit of the University of Cyprus. UnSaLa is currently funded by the Research Training Group 1878: Archaeology of Pre-Modern Economies, a joint research program of the Universities of Bonn and Cologne, funded by the Deutschen Forschungsgemeinschaft (DFG).

The first conference of the network on the topic *Spatial Analysis of Ritual and Cult in the Mediterranean* was held in 2015 in Dublin, and acted as the kick-off meeting for the establishment of the Network. The next meeting is planned to be held in 2018 in Rethymno, Crete on the topic *Digital Approaches to Ritual Space*, and the third meeting in 2021 in Cyprus on the topic *Religious and Insular Identities in Context*.

The Network encourages direct contact and research cooperation, such as joint research activities, exchange of faculty members, postdoctoral fellows and research associates for lectures and network meetings, exchange of students for study and research, co-organisation and participation in lectures, seminars and conferences, and co-organisation of teaching activities and training courses. We are open to ideas and future collaborations via the Network. For further information please visit our website: http://www.ucy.ac.cy/unsala/ and like us in Facebook.

Dr Giorgos Papantoniou, Rheinische Friedrich-Wilhelms-Universität Bonn, papantog@uni-bonn.de
Dr Christine Morris, Department of Classics, Trinity College Dublin, cmorris@tcd.ie
Dr Athanasios Vionis, Department of History and Archaeology, University of Cyprus, vionis@ucy.ac.cy
Dr Apostolos Sarris, GeoSat ReSeArch Lab, FORTH, Crete, Greece, asaris@ims.forth.gr

Digital Humanities and Ritual Space
19-21 October 2018
Laboratory of Geophysical-Satellite Remote Sensing and Archaeo-environment
Melissinou & Nikiforou Foka 130, Rethymnon 74100, Crete, Greece

An international conference organised by the Unlocking Sacred Landscapes (UnSaLa) network

This is the second international meeting of the *Unlocking Sacred Landscapes (UnSaLa)* network, initiated by an Irish Research Council/Marie Curie Fellowship, and currently supported by Research Training Group 1878: Archaeology of Pre-Modern Economies of the Universities of Bonn and Cologne. The idea of the Network is based on an agreement of collaboration between the Department of Classics of Trinity College Dublin, the Laboratory of Geophysical-Satellite Remote Sensing and Archaeo-environment of the Foundation of Research and Technology-Hellas, and the Archaeological Research Unit of the University of Cyprus (for further information visit http://www.ucy.ac.cy/unsala/). This meeting will take place in Rethymnon, Crete.

The meeting will focus on digital approaches both to ritual space and to artefacts relating to ritual practice and cult. The terms ritual and cult are used broadly to include sanctuaries, temples, and churches, as well as the domestic and funerary spheres of life. We particularly welcome papers with a strong methodological focus on computational developments, digitisation processes and spatial analysis. Although the main focus of the network is the Mediterranean region, we also warmly welcome relevant papers from colleagues working in other areas of the world, with a view to stimulating wider methodological dialogues and comparative approaches. The chronological range is also open, ranging from prehistory to the recent past, and including cultural heritage management.

In particular, we welcome archaeological, art-historical, anthropological, ethnographic, historical, computational, cultural heritage or inter-disciplinary papers dealing with:

(1) inter- and intra-site Geographic Information System (GIS) approaches and spatial statistics and modelling of ritual space and/or its associated material assemblages,
(2) digitisation and virtual reconstruction of ritual space and/or its associated material assemblages,
(3) remote sensing\aerial\satellite approaches to ritual space,
(4) other computational methods and developments (e.g. space syntax and 3D modelling) applied to ritual space and/or its associated material assemblages,
(5) digital approaches to culture heritage management and culture heritage studies of ritual space and/or its associated material assemblages,
(7) digital approaches to phenomenological, performative and experiential analyses related to ritual space and/or its associated material assemblages.

Papers should be 20 minutes long. Posters may also be accepted. The official language of the workshop is English. Selected papers of the workshop will be published in the form of a peer-reviewed collection of studies and not as conference proceedings.

There will be a registration fee (60 euros) to cover coffee-breaks, one dinner, and an excursion on 21st of October. Please submit a 300 words (maximum) abstract to papantog@tcd.ie by **March 30, 2018.** Notification of acceptance will be made by April 30, 2018.

Convenors:
Dr Giorgos Papantoniou (University of Bonn)
Dr Apostolos Sarris (Foundation for Research and Technology-Hellas)
Dr Christine E. Morris (The University of Dublin, Trinity College)
Dr Athanasios K. Vionis (University of Cyprus)

Further information:
http://www.ucy.ac.cy/unsala/workshops/rethymnon-2018

BOOK REVIEWS
David Hill, Associate Editor

The Ancient Nasca World: New Insights from Science and Archaeology, edited by Rosa Lasaponara, Nicola Masini, and Giuseppe Orefici. 2016. Springer Publishing, Dordrecht, Netherlands. xiii + 670 pages, illustrations, photographs and maps (some color). ISBN: 978-3-319-47050-4, 3-319-47050-7, $159 (Print, hardcover), 978-3-319-47052-8, $119 (eBook).

Reviewed by Christine M. Pink, Department of Sociology and Anthropology, Metropolitan State University of Denver

This volume presents the results of over 30 years of archaeological inquiry in the Nasca drainage by Proyecto Nasca led by Giuseppe Orefici, and the Italian Mission of Heritage Conservation and Archaeo-Geophysics (ITACA) directed by Nicola Masini and Rosa Lasaponara. Several important themes emerge around human adaptation to, and modification of, a harsh environment. The goal of Proyecto Nasca is to obtain as much data as possible about the real social and political-economic organization of Nasca society (p. 6). The ITACA Mission focuses on the innovative use of remote sensing and geophysical methods focusing on: establishing the extent of Cahuachi; testing the ability of remote sensing to distinguish natural phenomena and human-made structures; identifying buried architecture; understanding the geoglyphs and their relationship to Cahuachi; locating and dating *puquios*; and finding ways to use remote sensing and geophysics to protect and preserve cultural heritage (p. 479). This work is an invaluable contribution to the ever evolving body of knowledge regarding pre-Columbian Peru and the Nasca culture.

The initial chapters provide a robust framework for later discussions of project findings. The environment (Ch. 2), geology (Ch. 3), plants (Ch. 6), and human demography (Ch. 5) are comprehensively described. A thorough review of the history human occupation in the drainage, and the regional importance of the Nasca culture and Cahuachi are also presented (Chs. 4, 7-9, 14, 15, and 19). Detailed analyses of specific assemblages including petroglyphs (Ch. 10), *antaras* and whistles (Ch. 17), textiles (Ch. 18), and polychrome pottery (Ch. 24) are also offered. In each case the analyses enrich current interpretations of the Nasca situated in their regional and chronological contexts using novel approaches to gathering and interpreting data. For example, Chapter 17 not only addresses manufacture of *antaras*, but offers a technologically savvy qualification of sound and how it would have been experienced by those at Cahuachi.

Chapter 13 comprehensively describes and inventories *puquios* in the region. The importance of the *puquios*, allowing access to underground water, cannot be overstated with regard to successful settlement of the valleys and rise of Nasca culture. Authors describe pioneering use of technologies to detect ancient inoperative *puquios*. Chapter 22 expounds this work coupled with GIS-based analyses of settlement patterns around the water sources. Issues surrounding the dating of *puquios* are also addressed, and authors attribute their construction to Nasca with possible augmentation by subsequent groups. Knowledge of the *puquios* and their spatial distribution is essential to understanding Nasca societal organization. The authors also plan to communicate findings to the modern inhabitants so that they may restore and use the *puquios* to enhance their communities.

The significance of Chahuachi as a ceremonial center is well-established and the history of investigations there is extensively reviewed. The authors hypothesize that restricted access at Cahuachi meant that large numbers of pilgrims could not have directly participated in rituals and the geoglyphs fulfilled a need for additional ceremonial space. Chapter 11 reviews past interpretations of regional geoglyphs, and Chapter 12 addresses the geoglyphs at Pampa de Atarco specifically. Novel data-gathering techniques including drones, and GIS-based analyses demonstrate geoglyph's orientation to pyramids at Cahuachi supporting the hypothesis that these were places where pilgrims would have conducted rituals likely related to water and fertility.

Remote sensing and geophysical investigations yielded significant information about architecture and Nasca lifeways. Chapter 20 reviews a number of techniques that were tested by the ITACA Mission. Importantly, they evaluate and give examples of those that did, and did not work well in the environment. Chapter 21 describes the use of satellite Synthetic Aperture Radar (SAR) methodology to appreciate changes in the landscape due to both natural and anthropogenic causes. The final two chapters also focus specifically on the use of remote sensing to monitor destruction of archaeological sites and geoglyphs. Although not currently implemented, the authors argue for using study results to encourage community involvement in cultural heritage preservation.

The greatest merit of this volume lies in the methodological innovation drawing from many disciplines in addition to archaeology, and detail-rich descriptions of analytical findings addressing the goals of the project. The explicit focus on conservation and public engagement is also to be commended. *The Ancient Nasca World* is an essential addition to the Andeanist's library.

RESEARCH OPPORTUNITIES

Call for Proposals: NSF-Subsidized Projects in the Archaeometry Lab at the University of Missouri Research Reactor, Columbia MO, USA

Annual Submission Deadlines: April 15th & October 15th

The Archaeometry Lab at University of Missouri Research Reactor maintains a continuous program of NSF-subsidized support for research in elemental and isotopic analyses. Our goal is to facilitate access to MURR Archaeometry facilities and research expertise. We offer analytical services and collaborations using neutron activation analysis (NAA), X-ray fluorescence (XRF), and inductively coupled plasma-mass spectrometry techniques (LA-ICP-MS and MC-ICP-MS). MURR is one of few Archaeometry laboratories in the world providing in-house access to all of these techniques. We specialize in compositional analysis of archaeological ceramics by INAA, and analysis of obsidian, chert, hematite, and limestone by a combination of techniques. We also support elemental and isotopic analysis of other artifact and raw material classes including sediments, metals, glass, pigments, and ceramic paints and glazes.

Investigators interested in applying to the NSF-Subsidy program are required to submit a short application form, a descriptive mini proposal, and a brief curriculum vita for each principal investigator. The proposals must describe an anthropological research project for which chemical analysis is essential. Research questions must be well defined, as does sampling strategy. Proposals are assessed by an advisory committee consisting of internal and external reviewers. All program participants are required to accept the conditions of the Archaeometry Laboratory's Data Management and Sharing Plan: http://archaeometry.missouri.edu/data_management_policy.html

Mini-proposal program inquiries and submissions should be directed to Jeffrey R. Ferguson (FergusonJe@missouri.edu). For detailed information on mini-proposal criteria and guidelines please visit: http://archaeometry.missouri.edu/nsf_program.html.

UPCOMING CONFERENCES

The ***12th Iberian Congress of Archaeometry*** will be held between October 25th and 28th at the Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) in Burgos.

The Iberian archaeometry community will meet to discuss the technological advances and their possible applications to the material study of historical, archaeological and cultural heritage. The event will take place in a city with a long-standing artistic heritage, including three UNESCO world heritage sites: the Cathedral of Burgos, the Route of Santiago de Compostela and the Archaeological Site of Atapuerca. Very close to the Cathedral – one of the city's symbols – lies a more modern landmark: the Complejo de la Evolución Humana, designed by the prestigious architect Juan Navarro Baldeweg, and comprising the Museum of Human Evolution, the Forum Evolución Auditorium and Congress Hall, and the Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), where this Congress will be held.

The technical sessions of the 12th Iberian Congress of Archaeometry will take place at the Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) in Burgos in October 2017. During the congress, communications will be presented to address progress and novelties in the following thematic areas:

- Ceramic and vitreous materials
- Biomaterials and paleoenvironmental studies
- Metals
- Lithic material and pigments
- Dating
- Physical prospecting, remote sensing and spatial analysis
- Built heritage, preservation and restoration
- Image analysis, 3D-scanning and computed tomography

Presentations may be given orally or in a poster form.

For questions about registration or payment, please contact inscripciones@cia2017.com

More information can be found at the conference website: https://en.cia2017.com/.

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