SAS BULLETIN

NEWSLETTER OF THE SOCIETY FOR ARCHAEOLOGICAL SCIENCES

Volume 41 Number 3 **Fall 2018**

FROM THE PRESIDENT

RACHEL POPELKA-FILCOFF

Welcome to a special edition of the *SAS Bulletin*. This issue celebrates the 40th anniversary of SAS. This edition also brings about some new changes to the *Bulletin* and commemorates its past. In our next issue, the final one for 2018 (issue 4), we will be transitioning to a new *Bulletin* format. This change will occur gradually from the quarterly PDF format of articles on aspects of archaeological science, to a hybrid version of quarterly editions and edited online articles. The content will be timelier and more integrated into SAS communications through the website, email and social media. This format will be more expedient, especially for time sensitive information such as job announcements and abstract deadlines. However, the content, including longer articles, will still be available as a digest form on a quarterly basis. Issue 4 will still have some of the traditional content as we migrate to the new format in 2019. We also thank Tom Fenn for his role as Editor for the past two years, as well as the contributions from the Associate Editors, many of whom will continue to contribute to the *Bulletin* in its new format. The role of Editor is currently open, and we are looking for expressions of interest for this role.

SAS recognises the tradition of the *Bulletin* from its very early days in 1977, starting as a paper-based, mailed newsletter, edited by one of the founding members, Erv Taylor. Please see http://www.socarchsci.org/sasb.html for all of the editions of the *Bulletin*. Several editors over the decades have taken this tradition and shaped the *Bulletin* to what it is today, and we recognise them. We have come full circle in a sense, with the 40th anniversary sessions at the 2018 SAA Meeting, convened by past and present SAS General Secretaries, Erv Taylor, Rob Sternberg and Kyle Freund. Please enjoy these reflections on 40 years of archaeological science.

We look forward to sharing these changes with you. As we migrate to a more social media based *Bulletin*, we look to the membership to also contribute to the important conversations about archaeological science worldwide. We also look forward to your feedback.

IN THIS ISSUE

PROCEEDINGS OF THE 83RD ANNUAL MEETING OF THE SOCIETY FOR AMERICAN ARCHAEOLOGY (SAA), WASHINGTON, DC, APRIL 11-15, 2018

KYLE P. FREUND, CO-CHAIR
ROB STERNBERG, CO-CHAIR
R.E. TAYLOR, CO-CHAIR

Title: Advances and Prospects in the Archaeological Sciences on the 40th Anniversary of the Society for Archaeological Sciences (I and II)

SAS was founded in 1977, and to celebrate the organization's 40th anniversary two interactive forums were organized at the 2018 SAA Annual Meeting to reflect on the past, present, and future of archaeological science within the broader discipline. To achieve a balanced representation of viewpoints, we attempted to include both established scholars as well as early career researchers in a range of specialties, including isotopic bone studies, organic residue analysis, chronometric dating, and lithic, ceramic, and pigment analysis.

Presentations were structured by a series of guiding questions about the history of archaeometry and its role in 21st century archaeological discourse. Emerging from these discussions was a diverse array of thoughts and perspectives on quantitative literacy, access to technology, knowledge production, community engagement, archaeological ethics, and the importance of inter-disciplinary collaboration. Another recurring theme that sparked intensive debate concerned the positive and negative effects of the North American tradition of incorporating archaeology within the field of anthropology. These issues are outlined in the following contributions from several forum participants. We would

like to thank all those involved for making this endeavor a success, and we hope you enjoy.

Archaeological Science in the 21st Century

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I'm feeling positive about the prospects for Archaeological Science at the moment, due in no small part to the successes of the Wiener Laboratory for Archaeological Science at the American School of Classical Studies. Earlier disciplinary tensions between Classical Archaeology and Archaeological Science are dissipating and have more recently produced a frisson of productive excitement. Due in large part to the vision and enduring support of Malcolm Wiener, the laboratory is assuming a highly visible role in the archaeology of the Eastern Mediterranean.

One of my admonitions to students and colleagues, certainly a feature of 20th century archaeological science and even more important today, is collaboration. While we realize that there is competition, especially now in archaeological genetics, as there was in isotopic research in the 1980s, none of this work can truly be done by a lone scholar in isolation. Knowledge of archaeological contexts, target materials, materials science, and so on need to come together in the generation of innovative ideas developed within a collaborative group. Trust, mutual respect, and other attributes necessary for human relationships pertain here. There exist tensions between the archaeologists who spend their careers seeking the ideal samples for analysis, only to be relegated to the middle of the author pack by laboratory folks who are the last in the chain of discovery. Contributions from those far distant from the laboratory setting should not be devalued. As aDNA studies resolve global issues, archaeological and historical questions will assume greater prominence, as will the scholars from these disciplines. Collegiality today will ensure a seamless transformation.

My own initiation into the world of archaeological collaboration occurred at Northwestern University. There I learned of a physical chemist, Joe Lambert, whose interest in European trade items I readily deflected to a glaze we observed on Illinois Woodland (~AD 800) cremated remains. He visited our archaeological excavations, and I recall how his expression paled as I described the field context as "my laboratory." Joe and I, along with a series of students collaborated happily on issues of elemental bone content, diet, and taphonomy. Further dietary and residence studies via light and heavy isotopes added colleagues Nick v.d. Merwe, Doug Price, and Kelly Knudson to the research stream. I've also come to value the contribution of various folks associated with CAST at the University of Arkansas, as we develop and implement programs in geophysical testing in the rich archaeological context of the lower Illinois River valley. Most recently, I've also been quite interested in pathogen aDNA, in collaboration with Anne Stone, Johannes Krause, and Kirsten Bos.

A caution about curriculum for archaeological science develops in the context of studies that link archaeological science to historical questions. Both engage ethical concerns. Archaeological scientists familiar with biomedical ethics may not fully engage with important issues descendent communities raise about the treatment of their ancestors. Archaeological scientists may be fully complying with the law, but yet fail to appreciate that they should be consulting with descendent communities prior to publishing their work. This has become obvious in a recent example of aDNA study of remains from Chaco Canyon. Consultation is crucial and anthropological ethics should be a part of archaeological science's knowledge base.

A second ethical concern is the obvious point that archaeological resources, whether human remains or ceramic residues are not renewable resources. Archaeologists know that they should excavate only that part of the archaeological record required to answer a question or to mitigate a modern impact. Scientists collecting samples from museum collections should be mindful of the same advice, eschewing expansive collection to corner a regional or topical market when analysis is not imminent. A minimalist approach to destructive sampling is prudent.

Having witnessed the full 40-year development of the SAS along with the various culture "wars" within Americanist anthropology, I nevertheless appreciate having been trained as an anthropological archaeologist. I firmly believe that an emphasis upon the recognition and definition of significant questions is key to our advancement of knowledge about humankind, whether developed from a humanist or a scientific perspective. How to frame such questions and how to bridge the divide between data and hypotheses about humankind's past need to be part of the curriculum in scientific archaeology. New, refined methods offer possibilities, but these are only realized in the context of significant research questions. How to recognize and develop the former to create the latter, linking the two in innovative ways remains a great challenge in research and training the next generation of archaeological scientists.

Science and Community Engagement

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After leading the Society for Archaeological Sciences (2009-2011), I realized the division between archaeological theorists and archaeological scientists, which Martinón-Torres and Killick (2015) have discussed so eloquently, was an unnecessary and unproductive existing division. Therefore, I decided to put an end to the existing division with the publication of the Encyclopedia of Archaeological Sciences (EAS) by Wiley, coming out this Fall. Scholars from the social sciences and the humanities have joined us in this venture, highlighting the value of archaeological data in providing innovative approaches and solutions to modern phenomena that are challenging our capacity to live on the planet. The contents of the EAS lay bare the following concerns, distinguishing this reference work from other valuable recently published projects.

Learning about potters and the process behind making pots gave way to these statements, by simply asking, how to move from chemical elements, compounds, and minerals to humans. Beyond distinguishing the difference between techniques and technology, which answers this question, my ethnoarchaeological project, until then, was worth of being considered archaeological sciences. When I noticed the introduction of development policies to combat poverty in the community that I was working at struggled to preserve their traditions and their identity, I couldn't simply stand there, watching how the ancestral technology of pottery making was being substituted for craft making industries. This scenario took me to unexplored areas in archaeological sciences to explain how institutional economics and policies incited such change.

By involving myself in protecting Mexico's heritage, I knew was going to be left out of the "science club", as GIS use for predictive modeling, social and heritage impact assessments, land-use planning, and even designing a mobile application for the iTunes and Android stores have no space in conferences, sessions or research groups related to archaeological sciences. Over the last couple of years, I stopped sending my research to specific scientific venues that I used to attend regularly, given that researching on poverty "does not matter", as it is not science, nor is it archaeology. I challenge this appreciation.

Publishing the EAS couldn't come at a better time. Across the globe, scientists have detected a decline of trust in science and scholarship, given the unsubstantiated assertions released through public discourse and disseminated by mass media. We are at fault for engaging only with the chemistry and physics of archaeological artifacts and not involving ourselves with the society we owe ourselves to, simply because within our community, addressing modern phenomena summarized within the sustainable development goals, is not science.

If archaeometry is destined to date artifacts and provide information about physical characteristics, and the role of archaeological sciences limits itself to publishing numbers and chemical elements, we have lost track of the statement that archaeology is anthropology. If we are not willing to interpret our results beyond physics and chemistry, we should not be surprised of the growing skepticism and even hostility towards science, extending all the way to conspiracy theories and alternative facts. Therefore, we should not be surprised by the re-emergence of nationalism, of radical and absurd standpoints, of the misconceptions of race and citizenship. I am not afraid of expressing that we bare some responsibility by disregarding community engagement as science in many forums and that some of us have decided to stand up and claim, Social Sciences and the Humanities matter!

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Martinón-Torres, M., and D. Killick (2015). Archaeological theories and archaeological sciences. In *The Oxford Handbook of Archaeological Theory*, edited by A. Gardner, M. Lake, and U. Sommer. Oxford Handbooks Online, Oxford.

Challenges for the Advancement of Archaeological Science and its Practice

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In celebrating the 40th anniversary of the Society for Archaeological Sciences (SAS), I would like to highlight three challenges we currently confront for further advancement of archaeological sciences, specifically within the US. Those three challenges are: 1) application of multi-method approaches; 2) quantitative literacy; and 3) teaching archaeological science in small institutions. Archaeological science has become an essential component for the renewed interest in culture history (e.g., provenance study, comparison of technological practices, and reconstruction of communities of practice) as well as for recent materiality approaches. I argue that those three challenges need to be addressed through coordinated efforts by archaeological scientists and hope that the SAS will play a central role in this endeavor.

1. Application of multi-method approaches

Thanks to the development of user-friendly analytical apparatuses (such as pXRF) and the institutions and companies that provide analytical services, the application of archaeometric techniques has increased tremendously in the past few decades. This is of course a welcome trend, but some scholars tend to rely on a single technique, which is not always warranted. This is probably due to the limited time and budget, access to the lab, and/or lack of knowledge. For example, soil geochemistry has become a relatively common practice, but the results often remain ambiguous as there is no one-to-one relationship between each element and kinds of human activities as well as between a specific location and kinds of activities. Therefore, it is critical to cross-validate the interpretation based on independent lines of evidence, such as micro-artifact analysis, micromorphology of floors, and traditional artifact analysis from excavations. These issues have been addressed by several researchers for various analytical techniques, and multi-method approaches will hopefully be widely shared.

2. Quantitative literacy

The increased use of archaeometric techniques has resulted accordingly in the increased availability and analysis of quantitative data. This is, again, a welcome trend, but it seems to me that the popularity of archaeometry is not paralleled by the improved quantitative education. As George Cowgill (2015) recently states, course offering in quantitative analysis is largely limited in the US, and as a consequence, many students have to self-learn the methods and theories of quantitative analysis. This is itself not a bad thing, but the improvement of software for quantitative analysis, such as SPSS, allows those students with limited understanding to conduct quantitative analysis fairly easily, resulting in misuses and misrepresentations of data analysis. For example, I have seen that several scholars use boxplots for modal analysis of ceramic vessels, but it is often the case that the central mode, which is shown in histograms, does not change while the median, which is shown in boxplots, increases or decreases through time (the latter just indicates the frequency and/or proportion of smaller or larger vessels increased). This example is not from archaeometry per se, but there are misuses even at this very basic level, and you can imagine what is going on for more complicated quantitative analysis. Due to the limitation of space, I limit myself to point out that there are more serious issues regarding sampling methods (representativeness and generalizability), interpretation of the significance of statistical significance (how to use *p*-values), evaluation of the assumptions for each statistical technique (homogeneous variances for *t*-tests, ANOVA, etc.), and over-reliance on a single technique.

Among these, I emphasize the significance of statistical significance. *P*-values are about the probability, not the effect size (strength of the relationship). While both the effect size and probability are conventionally reported for correlation and regression analyses, only *p*-values are reported for *t*-tests, ANOVA (and MANOVA), and chi-square tests largely because the effect size for these techniques is rarely addressed in popular textbooks. More serious problem is the over-reliance on $p = .05$ as a criterion for hypothesis testing. In 2016, the American Statistical Association released a statement regarding the use of p-value (http://www.amstat.org/asa/files/pdfs/P-ValueStatement.pdf), and I strongly encourage those practitioners of quantitative analysis to follow their lead.

In order to widely share such knowledge and to keep the acceptable level of quantitative analysis among students and scholars, we should ideally offer systematic courses more regularly at more universities. However, there are always practical difficulties for teaching and sustaining such courses. At Tulane University, we (anthropology department) used to offer both introductory and advanced quantitative courses, but it has become difficult to sustain the advanced course due to the decreased number of students. As a consequence, I decided to include some advanced statistical techniques within my Archaeometry (only at the graduate level). However, I think we need a more holistic and systematic solution. Hopefully, the SAS will be able to take a lead on this issue in the near future.

3. Teaching archaeological sciences in small institutions

The last challenge I want to address is about teaching archaeological science at small institutions. I did my Ph.D. at Arizona State University and post-doc at the University of South Florida, both of which are fairly large universities and are equipped with a broad range of labs and apparatuses. Tulane has the School of Science & Engineering, but the range of available equipment is highly limited. I assume other relatively small universities are in a similar situation. As hands-on practices are essential for learning archaeometry, we need to develop extra-curricular programs (such as the internship program at the MURR) for further advancement of archaeological sciences. I am hoping that the SAS will play a central role in creating more opportunities for students through coordinating multiple institutions, labs, and companies. This will also help to solve the first challenge I addressed above.

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Cowgill, G.L. (2015). Some things I hope you will find useful even if statistics isn't your thing. *Annual Review of Anthropology* 44: 1-14.

Surviving American "Anthropological Archaeology"

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"I am an anthropological archaeologist…": words that all job seekers over the past two decades have written on their cover letters. As archaeologists of a huge range of backgrounds and training force themselves into that same mold, the phrase has lost some meaning. Archaeology has become more specialized over the decades, with both positive and negative consequences for the health of the subdiscipline. Here I briefly reflect on Americanists relationship with anthropological archaeology and the role of archaeological specialists in that system.

Twentieth-century archaeology until the 1980s was closely aligned with sociocultural anthropology. In the early part of the century, archaeologists conducted similar classificatory work as ethnologists, focusing on cataloging and differentiating material culture over time and space. Indeed, both ethnologists and archaeologists conducted the era's most impactful work through the Bureau of American Ethnology. From the late 30s through the 70s archaeological data was used to answer some of the most pressing questions of cultural evolution and human interaction with both the environment and other human groups. The quest to understand cultural evolution in particular drove sociocultural anthropology for decades, but they were forced to turn to archaeology to understand how such change took place in a single region over the *longue duree*. More recently, the things archaeologists do on the ground have diverged considerably from the theories and subjects that cultural anthropologists entertain. There are many reasons for the divergence, but I focus only on the archaeologist's role here.

Over the same time frame mentioned above, archaeologists have become increasingly specialized. At the beginning of the 20th century, archaeology was dominated by generalists, equally versed in the latest sociocultural theories and asking big questions of human interest as they were in methods of digging and recording data. Into the 21st century, however, most of us are on a trajectory of hyper-specialization. Taking ceramics as an example, we have specialists in ceramic chemistry, ceramic petrography, 3d scanning of pots, radiography, CT scans, and dozens more. All these techniques have generally given rise to the term "archaeometry". There are parallel trends toward hyper-specialization for just about every aspect of archaeology, including GIS technology, remote sensing, geophysical analysis, geoarchaeology, and all materials analyses. The deep dive into specialized methodological and technological development has distanced what we do from a broader understanding among non-archaeologists. While chemists and physicists, for example, can get away with such a myopic focus, the health of American archaeology depends on public support and funding that may not continue unless we make what we do broadly accessible.

Specialization has brought a *huge* benefit to methodological development in archaeology, but it has also pushed most of those specialists outside the employment orbit for jobs in American anthropology departments. Voting members of job searches in most departments are mostly non-archaeologists who often do not necessarily care if the candidate developed a new way to chemically analyze individual grains within a ceramic fabric. "Can you teach a four-field 'Intro. to Anthropology' class?" The archaeologists who get jobs in this system tend to be generalists well versed in theory, but who also have some specialization that they employ to understand a problem of cultural significance and general human interest.

Given that specialization is necessary for methodological advancement, what is to be done? Our European colleagues have made room for specialists in archaeology or related departments. Large programs employ both generalist archaeologists and those on the forefront of method development. Many of the recent technological advancements in materials analysis and remote sensing have begun in Europe, as a result. On this side of the pond, the American experiment with an archaeology department at Boston University recently came to an end with its reintegration into anthropology and other departments. If there were more archaeology departments across the US, maybe that attempt would have met with more success? In the meantime, we are back to finding a role for ourselves in anthropology departments. To do so, specialists within archaeology must meet non-archaeologist, academics, and the public halfway and demonstrate the significance of their research in terms that non-specialists can understand. This isn't a simple matter of reducing jargon, but situating the research in a problem-oriented cultural framework. For example, many cultural anthropologists focus on materiality, which is ideally suited for specialist analysis in archaeology. In order to survive Americanist anthropological archaeology it is not enough to be the master of a technique in search of a question. I would go further to argue that the survival of American archaeology in general, particularly where government funding is involved, depends largely on demonstrating its importance to the public. Specialization is essential to advance our methods, but those specialists must also connect the micron to the big picture if we hope to thrive in the future.

Current Directions in the Application of Light Stable Isotope Techniques in Bioarchaeology

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The number of archaeological studies employing light stable isotopes to examine human diet, migration, paleoecology, and related issues has increased from a handful of studies each year in the 1990s to over 100 studies per year today. As a methodological tool, stable isotope analysis of archaeological materials has transitioned from a rare technique practiced in only a few laboratories to a regular part of the archaeological toolkit, alongside faunal analysis or paleoethnobotany, for example.

Despite this massive growth, many of the isotopic studies conducted today would not seem out of place if they were conducted in the 1990s. With the exception of the quantity of data that can be produced with continuous-flow techniques, the methodologies and interpretive mechanisms have remained fairly stagnant since the early days of this field. There has been some real growth, however, in last decade, both in terms of laboratory methodologies and interpretation of the isotopic data.

Most isotopic studies in archaeology have tended to focus on past human diet and the dominant mechanism of interpreting these data has been the 'calibrated eyeball' method. This method consists of essentially a qualitative reading of the distances between mixtures (the humans in this case) and sources (the foods in this case) on a bivariate scatterplot – the shorter the distance between the mixture and the source, the greater importance of that source to the mixture. Beginning around 2010, and increasingly since 2015, there have been more attempts to use quantitative mixing models, particularly those that use a Bayesian framework (e.g., SIAR, mixSIR, FRUITS), to interpret these data. There are a few clear advantages to these models: they are explicitly quantitative rather than qualitative and they take into account uncertainty in the source parameters and *convey* this uncertainty in the model outputs as credibility ranges. For generalized omnivores like humans that often access foods from distinct ecosystems, these ranges are typically very large. The clear presentation of large ranges for the estimates of source (food) contributions more accurately captures the uncertainty that is inherent in attempting to quantitatively reconstruct diet composition in the past and in my estimation delivers the non-specialist reader a more honest characterization of what the data can actually say. Conversely, there are some clear disadvantages to these models. First, few users have a solid, or even passing, understanding of the underlying mathematics, so there is certainly a 'black box' element – I certainly count myself among these users. Secondly, given that the range of potential sources cannot be adequately sampled in many, if not most, archaeological contexts, the models are prone to having incomplete input parameters (missing sources). Nevertheless, the models will still calculate outputs in the absence of these missing sources, so there is potential for fairly significant misinterpretation of the data.

One of the ways that the problem of missing sources for human paleodiet studies is being overcome is through the isotopic analysis of macrobotanical remains. These studies are also yielding very interesting results about agricultural intensification and extensification. The macrobotanical remain as an analytical substrate has been largely ignored, so there is tremendous potential for future work in this area.

There is an increasing use of compound-specific isotopic analysis of individual amino acids or fatty acids, with the latter providing the most significant insight into past human behavior thus far, particularly as it relates to the use of secondary animal products such as milk. The methodological challenges with analyzing non-volatile compounds such as amino acids by GC/C/IRMS will mean that this methodology will be restricted to a small number of labs generating modest datasets for the foreseeable future. The most promising application for these techniques may be in paleoecology rather than paleodiet. Changes in diet composition should be differentiable from changes in the isotopic composition at the base of the food web by comparing source and trophic amino acids, which could clarify the causal mechanisms behind temporal shifts in bulk stable isotope compositions.

Increasingly, it is required (or at least encouraged strongly) that data be deposited into some kind of database. Easy availability of data is obviously essential to any scientific discipline and there should no debate that data must be made accessible to other scholars, however, the lack of quality assurance (QA) and quality control (QC) information that is reported is a major issue. The means with which isotopic data are calibrated is critically important and can produce fairly large systematic errors, but without the inclusion of the requisite QC and QA data along with published datasets, it will be impossible to know whether these errors exist. When large-scale data mining efforts begin and particular labs have been primarily responsible for producing the data for a certain region or time period, this may become a major issue and systematic errors caused by improper calibration may then appear to be real temporal or regional differences.

EXPRESSION OF INTEREST FOR *SAS BULLETIN* EDITOR

RACHEL POPELKA-FILCOFF

We are excited to announce that the format of the *Bulletin* will be changing in 2019 to a timelier electronic format, with digests provided quarterly as the issues. The *Bulletin* will be more integrated into our web and social media platforms and present some novel articles in addition to our traditional discipline-specific area. Issue 4 of 2018 will be a hybrid of our traditional articles with some new formatting and content.

The Society for Archaeological Sciences is seeking an expression of interest for the Editor of the *Bulletin*. This role will allow the appointee the ability to establish direct connections with numerous researchers at all levels, give valuable insight into editorial procedures as well as the opportunity to shape SAS and the field more broadly. We are encouraging early- to mid-career scholars to apply for this role.

Responsibilities

- Oversee the publication of the *SAS Bulletin*
- Coordinate content from the Associate Editors and contributors
- Coordinate content with VP Social Media and VP Website for cross-posting of information
- Maintain editorial guidelines as established by the SAS Executive
- Meet deadlines for production and publication
- Produce and communicate timely content
- Design and contribute to new *Bulletin* format
- Contribute as a member of the SAS Executive

Applicants should ideally possess:

- Experience in archaeological science at the postdoctoral level (or equivalent number of years in practice)
- Experience in editing
- Ability to dedicate time to *Bulletin* responsibilities
- Ability to respond quickly and communicate time-sensitive information
- Ability to manage projects and deadlines
- Basic knowledge of publication organisation coordinated with social media and web communication
- Initiative towards developing a new mode of communication within SAS

When submitting an expression of interest, please submit a CV and a one-page document addressing the criteria. The EOI is due October 31 and we will appoint an Editor shortly thereafter. This is an opportunity to shape the voice of SAS and the profession of archaeological science.

SAS BULLETIN

NEWSLETTER OF THE SOCIETY FOR ARCHAEOLOGICAL SCIENCES

***Published quarterly by the Society for Archaeological Sciences.* ISSN 0899-8922.**

Distributed to subscribers: $25/yr regular membership (electronic); $50/yr regular membership (paper & electronic); $15/yr student and retired (electronic); $40/yr student and retired (paper & electronic); $40/yr institutional; $300 lifetime (electronic); $450 lifetime (paper & electronic). Individuals add $135/yr for *J. of Arch. Science* (paper); $55/yr each for *Archaeometry* and *Archaeological & Anthropological Sciences* (paper); $43/yr and $25/yr each for *Archaeometry* and *Archaeological & Anthropological Sciences*, respectively (electronic).