



# SAS Bulletin



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### Microfossil Magic!

#### The First European Phytolith Workshop

The McDonald Institute for Archaeological Research, part of the University of Cambridge, England, was the venue for the first European Phytolith Workshop on 23rd November, 1995. An informal one-day meeting organized by Dr. Alix Powers-Jones, the Research Director of the Cambridge Phytolith Project, the workshop provided an opportunity for phytolith researchers and those less formally associated with phytolith studies to meet and exchange ideas and information.

Phytoliths (microscopic silica plant fossils) are common on archaeological sites, but infrequently studied in Europe and incompletely understood. This first workshop created a forum for the presentation of research work and for informal discussion. Participant came from both botanical and archaeological backgrounds, and represented a range of experience from complete beginners to established researchers. The workshop was fortunate to welcome in the audience Toronto botanist Alan Sangster, who did much pioneering work on grass phytoliths, and Tim Laurence (Royal Botanic Gardens, Kew) who is currently working with Wendy Matthews (McDonald Institute) on the identification of plant macro-remains in soil thin sections from the Syrian site of Tell Brak.

A series of short talks in the morning outlined the potential breadth of phytolith studies—some of them rather unexpected!—while the afternoon was given over to the practical side of phytolith analysis. Martin Hodson (Oxford Brookes University) gave the opening presentation on the identification of wheat hair cells on the basis of their pits. Although the work has strong archaeological links with Israeli sites, an unusual application was pasta quality control. It could be used to check that manufacturers had actually used durum wheat rather than a cheaper alternative in the production of pasta. The cereal theme was continued by Alix Powers-Jones. She discussed the potential for SEM and X-ray microanalysis of phytolith wall microstructure, as a means of identifying ancient irrigation practices.

The following two papers gave examples of how phytolith analysis has been used to good effect on two early urban sites.

The work of Marco Madella (McDonald Institute) on material from Kot Diji in Pakistan highlighted the recovery and analysis of disarticulated (individual) phytoliths. Wendy Matthews discussed the presence of articulated phytolith remains in soil micromorphology sections from Tell Brak, and Abu Salabikh in Iraq.

The final two talks gave some indication of new directions for phytolith studies. Liping Zhou (McDonald Institute) gave a brief account of recent phytolith work in China, before going on to discuss the potential for the study of phytoliths in the loess deposits of China and the former USSR. Jill Thompson (Bradford University) discussed the problems she encountered in the recovery of rice macro-remains on her Far East sites, and how rice phytoliths may be the key to understanding cereal treatment and disposal patterns on ancient sites.

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After lunch the laboratory session commenced with a visit to the new Multi-Imaging Centre (MIC). This multi-faculty facility is directed by Dr. Patrick Echlin (Department of Plant Sciences, University of Cambridge) and plays an important part in phytolith studies at Cambridge. The MIC is equipped with some of the latest confocal and electron microscopes, as well as dedicated sample preparation facilities.

Workshop participants then examined samples in the George Pitt-Rivers laboratory of the McDonald Institute. Informal and lively discussions followed about the sources of phytoliths found in a number of samples, including a "mystery object" sent by Freya Runge (Paderborn University), who was unable to attend in person, but who sent microscope slides and photographs in her stead.

The day closed with a wine reception hosted by Prof. Martin Jones (Head of Department, Archaeology) and an agreement to make the workshop an annual event.

*Contributed by Dr. Alix H. Powers-Jones, The Cambridge Phytolith Project, McDonald Institute for Archaeological Research, Downing Street, Cambridge, CB2 3ER England.* □

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## News of Archaeometallurgy

An International Conference on Metals in Antiquity, followed by a Workshop on Metals Analysis in Archaeology, will be held 10–13 September 1997 at Harvard University. Information is available from the conference organizers: Suzanne M. M. Young, Archaeometry Laboratories, Harvard University, Peabody Museum, 11 Divinity Avenue, Cambridge MA 02138 USA, email: [Syoung@FAS.Harvard.Edu](mailto:Syoung@FAS.Harvard.Edu); or Dr. Paul Budd, Ancient Metallurgy Research Group, Department of Archaeological Sciences, University of Bradford, Bradford BD7 1DP, UK, telephone: 44-1274-383554, fax: 44-1274-385190, email: [P.Budd@bradford.ac.uk](mailto:P.Budd@bradford.ac.uk), internet: <http://www.brad.ac.uk/~pdbudd/personal.html>.

The fifth symposium in the series Materials Issues in Art and Archaeology (MIAA-V) will be held at the Fall Meeting of the Materials Research Society in Boston, December 2–6. Changes in addition to the East Coast location include the addition of John Merkel of the Institute of Archaeometallurgical Studies to the Technical Organizing Committee. Meeting information from the Materials Research Society, 9800 McKnight Road, Pittsburgh PA 15237, USA; telephone (412) 367-3003, fax (412) 367-4373. The organizers are James R. Druzick, The Getty Conservation Institute, 4503 Glencoe Avenue, Marina Del Ray CA 90292-7913, USA; telephone (310) 822-2299, fax (310) 821-9409, email: [jdruzick@getty.edu](mailto:jdruzick@getty.edu); Pamela B. Vandiver,

Conservation Analytical Laboratory, Smithsonian Institution MRC 534, Washington DC 20560, USA, telephone (301) 238-3700x162, fax (301) 238-3709, email: [pbv@cal.si.edu](mailto:pbv@cal.si.edu); John Merkel, IAMS, Institute of Archaeology, University College London, 31-34 Gordon Square, London WC1H 0PY, UK, telephone 44 71 286-5849, fax 44 71 383-2572; and John Stewart, Historic Conservation Branch, Canadian Heritage, 1800 Walkley Road, Ottawa, Ontario K1A 0M5 Canada, telephone (613) 993-2125, fax (613) 993-9796, email: [JOHN\\_STEWART@PCH.GC.CA](mailto:JOHN_STEWART@PCH.GC.CA).

The Thirteenth International Bronze Conference was held in May at Arthur M. Sackler Museum of Harvard University, the first time the Bronze Conference has been held outside Europe. This series of meetings was the outcome of a symposium on Classical bronzes jointly sponsored by Harvard and the Massachusetts Institute of Technology in 1969 whose proceedings were published in 1970 under the title of *Art and Technology*. The 13th Bronze Symposium was focused on several topics. One was the technical illustration of casting statuary as depicted on the Berlin Foundry Cup (which was on exhibit), and another the various materials inlaid in bronzes, the metal inlays including tin as well as silver and copper. But most important was a kind of "paradigm shift" as that was defined by Thomas Kuhn in *The Structure of Scientific Revolutions* (Chicago 1962): where once it was agreed that classical Greek statues were the originals and the copies were Roman, the concept of a kind of mass production of classical Greek bronze statuary is now being accepted. The method of production—indirect lost-wax casting—allowed reworking of details in the wax, and the joining of separately-cast body parts from different sets of master molds to assemble similar but not identical castings—a process illustrated on the Foundry Cup.

The accompanying exhibition, *The Fire of Hephaistos: Large Classical Bronze Statuary from North American Collections* was organized by Carol Mattusch in collaboration with Henry Lie. It is at the Toledo Museum of Art until January 5th, and moves to the Tampa Museum of Art February 2nd to April 13th. The catalog by Carol C. Mattusch (ISBN 0-916724-89-1, Cambridge MA: Harvard University Art Museums 1996) includes essays by Arthur Beale, A.E. Raubitschek, Blanche R. Brown, Beryl Barr-Sharrar, Brunhilde Sismondo Ridgway, and Andrew Oliver, as well as much technical information such as analyses, detail photographs, radiographs, and scanning electron micrographs. Further information can be obtained from Amy Brauer, Arthur M. Sackler Museum, Harvard University Art Museums, 32 Quincy Street, Cambridge MA 02138, USA; email: [brauer@husc.harvard.edu](mailto:brauer@husc.harvard.edu).

The sequel to *Greek Bronze Statuary from the Beginnings through the Fifth Century B.C.* (ISBN 0-8014-2148-9, Ithaca 1988) by Carol C. Mattusch was published in time for the Bronze Conference. It is her *Classical Bronzes: the Art and Craft of Greek and Roman Statuary* (ISBN 0-8014-3182-4,

Ithaca and London 1996), which contains much evidence illustrating the serial production of bronze statuary. The email address for Professor Mattusch is mattusch@osfl.gmu.edu. A background for these developments is presented in Michail Yu. Treister's heavily footnoted but less well organized *The Role of Metals in Ancient Greek History* (ISBN 90-04-10473-9, E. J. Brill 1996), where Treister makes the point that the movement toward professionalization of warfare in the Fourth Century BC, needing to stock armories and mint pay for mercenaries, led to the adoption of mass production in metal.

In 1993 an exhibition and seminar was held in the Basque country, at Banca. This is the site of copper and silver-bearing copper mines and a large copper foundry, closed after the French Revolution. A major iron works was built in the early 19th century after an attempt at operating a Catalan forge, then mining for copper and silver resumed later in the century. The earliest date for mining activity at this site has not been determined. The seminar proceedings, *Mines et établissements métallurgiques de Banca*, have been edited by Pierre Machot and run to more than 400 pages; copies are available for US\$40, including shipping, from J&D Editions, 18 rue de Folin, 64200 Biarritz, France.

The Archaeotechnology column in *JOM*, the Journal of the Mining, Metals, and Materials Society conducted by Robert M. Ehrenreich presented "Archaeometallurgy and the analysis of early sociotechnical systems" by Robert M. Ehrenreich in the July 1996 issue, pages 62–63, and "Roman-era copper production at the Cerro Muriano smelter" by Rafael Calabrés Molina, Antonio José Criado Portal, Juan Antonio Martínez García and José Jacobo Storch de Gracia, translated by Adrian Burton, in the September 1996 issue, pages 68–70.

James Thorburn plans a mining study tour to India this winter. Write Atalaya Tours Ltd., Ceinionfa, Capel Dewi, Aberystwyth SY23 3HR, UK; telephone/fax: 44 1970 82 89 89.

There is now a Jewellery Discovery Centre in England. Located in the Jewellery Quarter of Birmingham, it is the starting point for a tour around the old workshops of Smith and Pepper, who had manufactured jewelry and silver since 1899. The tour is conducted by a former member of their staff.

Dr. Sarel Shalev has completed his work at Oxford and has obtained a position in the Archaeology Department of the University of Haifa, where he will be able to cooperate in archaeological metallurgy with the Weizmann Institute.

If you have archaeometallurgical news to share or comments to make, please write or call:

Martha Goodway, Smithsonian Institution MRC 534, Washington DC 20560 USA; tel. 301-238-3700 x164; fax 301-238-3709; e-mail cal.meg@ic.si.edu. □

## Archaeometry Symposia

There are a LOT! of current and upcoming archaeometric symposia...many with information on the Worldwide Web:

Greek Society for Archaeometry, 3rd Symposium of Archaeometry, Athens from November 6–9, 1996: <http://www.ariadne-t.gr/arv2/archeo/uk.html>

Materials Issues in Art and Archaeology V, Materials Research Society, Fall Meeting, December 2–6, 1996: <http://www.wisc.edu/anthropology/sas/184D.htm>

The Sixth Australasian Archaeometry Conference will be held in the Australian Museum, Sydney, February 10–13, 1997. For details contact the Conference Manager, ains@ansto.gov.au

The Workshop in Archaeometry at the University of Buffalo will be held February 22–23, 1997. For details contact Phillip Mitchell, pcm@acsu.buffalo.edu

A symposium on Geochemistry and Archaeology at the American Chemical Society Spring Symposium, San Francisco, April 13–17, 1997. For details contact Richard Evershed: r.p.evershed@bristol.ac.uk

Computer Applications & Quantitative Methods in Archaeology, 25th Anniversary Conference, The University of Birmingham, April 10–13, 1997: <http://www.bufau.bham.ac.uk/caa97/caa97.htm>

Archaeological Sciences '97 Durham, University of Durham, UK, Sept. 2–4, 1997: <http://www.dur.ac.uk/Archaeology/confs/ArchSci97.html>

Metals in Antiquity, Harvard University, Sept. 10–13, 1997. For details contact Syoung@FAS.Harvard.Edu

Second National Congress on Archaeometry, Zaragoza, Spain, Sept. 16–19, 1997. Abstracts deadline 30 Nov. 1996. For details contact jperez@msf.unizar.es

International Symposium on Archaeometry 1998, Budapest, Hungary from April 27 through May 1, 1998: <http://origo.hnm.hu/ametry98/homep1.html>

ABSTRACTS OF PAPERS AND POSTERS presented at the International Symposium on Archaeometry, May 20–24, 1996 in Urbana, Illinois are available at: <http://www.wisc.edu/anthropology/sas/ARK96.htm>

ABSTRACTS are available for the just-completed Workshop on "The Practical Impact of Science on Field Archaeology" October 28–29, 1996 in Israel: <http://www.wisc.edu/anthropology/sas/isrwrk.htm>

This information is also available through the SAS web pages (see the report on page 12 of the *Bulletin*): <http://www.wisc.edu/anthropology/sas/sas.htm>

## Book Reviews

**Ecology and Ceramic Production in an Andean Community.** Dean E. Arnold. *New Studies in Archaeology*, Cambridge University Press, 1993. 278 pp., 9 tables, 123 figs., index. \$64.95 (cloth).

*Reviewed by Jean-Christophe Galipaud, Charge de Recherche, Office Scientifique de la Recherche pour le Developement en Cooperation (ORSTOM), Paris, France*

Arnold is well known amongst archaeologists for his interest in understanding the cultural process which underlies ceramic production. In this respect, *Ecology and Ceramic Production in an Andean Community* will be of great interest for many archaeologists throughout the world working on pottery.

The book explores the link between ceramic production and society in a given environment: the Peruvian Andes. The subject is not new but the author, focusing on the community of potters rather than on their production, succeeds in presenting a clear and valuable picture of this complex question. Ten chapters lead step by step through the different aspects of Andean pottery technologies in their cultural and natural settings.

In the introduction, the author sets the theoretical background around which the book is built and reviews the different stages of his fieldwork which took place in and around the village of Quinoa in the central portion of the Ayacucho Valley in Peru. Chapter 2 is a concise but precise review of the environmental context as well as of the spatial organization of the Quinoa community.

In chapter 3, Arnold describes the major events which occurred in the valley during the last 1500 years. Chapter 4 focuses on the population and its relationship with these unique conditions. Chapters 5 through 8 explore the technical aspects of pottery production and distribution. Chapters 7 and 8 examine designs and styles and try to relate the styles with the community's organization, behavior and beliefs. In chapter 9, Arnold discusses the regional archaeological implications of his study and in chapter 10 he presents the implications of his approach to the understanding of archaeological ceramic assemblages in general.

The book is the result of a long lasting commitment to the anthropological and archaeological study of the Andean region. It follows up a series of publication by this author on the same subject and can be seen as a synthesis of 30 years of commitment to the study of pottery and its relationship with human cultures. As such it represents an important contribution to our understanding of the mechanisms which can

trigger pottery production in specific cultural and natural settings. His emphasis on the potter rather than the pot and his use of an ecologically oriented approach expands the scope of previous ceramic theories and allows by comparison a better insight into prehistoric potting communities. The book further provides some excellent methods for comparing past and present potting practices. Of particular value is the study of the social significance of designs and styles, an important issue for many archaeologists using typological classifications based on style (chapter 7).

The style is clear and precise; it is elegantly written. The book is well illustrated with simple graphs and drawings and a number of good quality black and white photographs. Short summaries at the end of each chapter further clarify the reading.

I certainly recommend this book to individuals and institutions interested in issues related to past and present pottery manufacture. □

**Lost Scents: Investigations of Corinthian "Plastic" Vases by Gas Chromatography-Mass Spectrometry.** William R. Biers, Klaus O. Gerhardt, & Rebecca A. Braniff. *MASCA Research Papers in Science and Archaeology* 11. University of Pennsylvania Museum of Archaeology and Anthropology, Museum Applied Science Center for Archaeology, Philadelphia, 1994. xi + 72 pp., 16 figs. \$30.00 (cloth).

*Reviewed by Charles C. Kolb, Division of Preservation and Access, National Endowment for the Humanities, Washington, DC*

Ceramics are one of the primary loci for the survival of organic residues of interest to archaeologists. The direct evidence of container use may be ascertained by the analysis of vessel contents, use wear, and external deposition. The identification of the original contents and functions of ancient ceramic cooking and storage vessels, among other types, leads to more finite socioeconomic interpretations. Most research has been devoted to the analysis of food residues rather than the delineation of perfumes and scented oils, the topic of the volume being reviewed.

During the past two decades, scientific analysis to determine the original contents of ceramic containers has become a significant and illuminating research area in archaeology, and frequently involves chemists or biochemists

working cooperatively with archaeologists and art historians. Michael Deal (1990) has commented in the *Bulletin* about the importance of this significant interdisciplinary research and this MASCA volume documents this cooperation. Two of the authors, Biers and Braniff, are from the Department of Art History at the University of Missouri at Columbia, while Gerhardt is affiliated with the Experimental Station Chemical Laboratories-Mass Spectrometry Facility and the Department of Biochemistry at the university.

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*"This is an important study, both for the results reported and the initial interpretations derived, but also for the nondestructive analytical procedures developed and tested."*

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This slim volume documents the results of original research conducted at the University of Missouri on a typologically unique but important vessel category. In 21 pages of text accompanied by 21 pages listing chemical compounds, the authors propose new nondestructive extraction procedures for a more precise analysis of vessel contents. Although this research was not conducted at MASCA, it is appropriate that this cutting edge methodology is published in this important series, which includes other major works on vessel content analysis (Biers and McGovern 1990). (MASCA's facility and publications were recently profiled in an issue of the *Bulletin* [Miller 1993].)

"Plastic" vases are small containers molded in the shape of animals (such as hares and rams), mythological creatures (gorgons), and human busts or body parts (feet), which were distributed throughout the Mediterranean region (Italy and Sicily to Asia Minor and North Africa) during the seventh and sixth centuries B.C.E. The vessels derive their name from the Greek word *plastos* meaning molded or formed, although components may be wheelmade, handformed, or created in clay molds. Their small size, narrow necks, and tiny mouths are similar to the aryballos and the alabastron. Typically the containers were decorated in black gloss, but specific groups also had polychrome or incised detail.

The authors review briefly the chief centers of manufacture: Corinth, East Greece (Rhodes), and Western (southern Italy-Sicily). They follow Sparkes' (1991) recent study in defining ceramic shapes. In the past, scholars have assumed on the basis of archaeological contexts and vessel configurations that these containers held ancient precious perfumes or scented oils that needed to be dispensed frugally. The earliest literary works which cite perfume recipes and manufacturing processes date to the fourth and first centuries, and are summarized (Theophrastus *Historia Plantarum*, de *Ordoribus* IV.5.2; Dioscordies *De Materia Medica* I.56; and

Pliny the Elder *Naturalis Historia* XIII.2.5). The authors also discuss previous interpretive scholarship regarding vessel functions, including religious, funerary, chthonic, folkloric, and picturesque.

Interestingly, plastic vases are not depicted in Greek art nor are they referred to by any ancient literary sources. In the past, interpretations depended nearly exclusively upon a knowledge of archaeological contexts and decorative parallels in vase painting. Although East Greek plastic vases have been studied using optical emission spectroscopy (Jones 1986), no vessels from Corinthian or other manufactories have been examined by physicochemical techniques. However, older techniques looked specifically for one product (such as olive oil) and ignored the existence of other substances.

Therefore, the authors sought to identify vessel contents more precisely in order to discern specific vessel function and clarify iconography. The methodology and initial results of a pilot project (Biers *et al.* 1988; Gerhardt *et al.* 1990) were based on a sample of only four vases. The goal of the current research is to develop and test a nondestructive method of analysis and to collect and examine as many examples of Corinthian plastic vases as possible. The present report, which expands and refines these earlier techniques and results, employs 24 vessels (20 Corinthian, 3 East Greek, and 1 Cretan), and identifies a range of substances. Vessels were obtained from more than nine collections, with the J. Paul Getty Museum and the Museum of Art and Archaeology at the University of Missouri each providing seven.

For fats and oils the primary methods of analysis include Fourier transformation spectrometry, infrared absorption, mass spectrometry, gas chromatography, and proton magnetic resonance spectrometry, among others, which identify specific fatty acids, cholesterol, triglycerides, and other components of organic materials. However, gas chromatography is especially well suited to identify organic materials such as oils and resins. Characterizing a wide range of natural products, capillary gas chromatography (GC)—which is very sensitive and highly specific to the analysis of lipid mixtures—affords the separation of a complex compounds into its components, which are then discerned by interfaced mass spectrometry (MS). Linked GC-MS holds considerable promise for use in the studies of vessel function, diet, and distribution of unique foodstuffs and other products such as dyes and perfumes.

Ideally, substances should be measured carefully both in the container and the context in which the vessel was found in order to minimize the effects of the postdepositional environment. An examination of substances from the interior and the exterior vessel walls, mouth, and base may also assist in determining container reuse and depositional contamination. None of the specimens examined had any visible, measurable remains of oils or other substances, although the

specimen from the Toledo Museum of Art still contained soil which was analyzed separately and had chemical compounds similar to those found in the vessel's fabric.

The current study employs two separate extraction solvents (methylene chloride and methanol) to penetrate the ceramic pores and remove samples for analysis. Instrumentation includes a Kratos MS25 double-focusing mass spectrometer equipped with a Carlo-Erba 4160 Fractovap gas chromatograph and a DS-55 data system operating on a Data General Nova 4X computer. Specimen patterns were compared via library search routines to the approximately 112,300 compounds included in the major databases (NIH/EPA and NIST Computer Libraries, Wiley/NBS Registry of Mass Spectral Data, and Eight-Peak Index of Mass Spectra). A BenchTop PC/Probability-based Matching System was also used.

The research determined that nondestructive GC-MS extraction and analysis can retrieve compounds from the fabric of the ancient vessels. The procedures did not affect the fabric or decoration and no vessel was damaged in any way by the solvents used. Three vessels contained more than 100 identifiable compounds and others contained very few (potentially the result of thorough cleaning following excavation). The number of compounds per vessel ranges from 114 to 18. Modern contaminants (the pesticide DDT, silicone compounds, plasticizers from glues and plastic packaging, caffeine, and nicotine) were notable. Cholesterols, long-chain fatty acids, and over 40 terpenoids were discerned, but in no instance were the authors able to match specifically the contents of a vessel with any recipe extant in the ancient sources. The famous iris perfume could not be identified, but information about the origin and nature of juniper, pine, and cypress resins were delineated.

In sum, the authors suggest that these vessels contained an oil, perhaps olive, scented with a resin (represented by specific fatty acids and terpenoids), and that these contents were not among the very costliest perfumes. In addition, there was no correlation between vessel configuration and contents. While the technique is non-destructive, it is also costly and labor intensive, and subject to modern contamination. The chemical evidence is consistent with pungent (rather than floral) scented contents and the *enfleurage* method of extracting scents may have been used in Corinth in the sixth century B.C.E. The authors suggest that it is possible that these scents may have served as insect repellent or in embalming. Appendix II suggests protocols for treating intact specimens during excavation to avoid modern contamination.

This is an important study, both for the results reported and the initial interpretations derived, but also for the nondestructive analytical procedures developed and tested. No longer is it necessary to pulverize a potsherd before extraction; therefore the artifact is not destroyed or damaged. The

extraction solvents, unlike strong acids or bases used in gas-liquid chromatography (GLC), do not alter the composition of the original fatty acids in the oils nor are aldehydes or ketones, which may be useful "markers," destroyed. In the future it will be possible to determine more precisely the places of origin of the contents of ceramic vessels and elucidate the production and distribution of ancient craft products and foodstuffs.

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**In The Wake of Contact: Biological Responses to Conquest.** Clark Spencer Larsen and George R. Milner (eds.). Wiley-Liss, New York, 1994. viii + 206 pp. \$89.00 (cloth).

*Reviewed by Patricia M. Lambert, Department of Anthropology, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599*

This collection of 15 contributed papers offers a well-balanced and thought-provoking coverage of the biological consequences of New World contacts. The volume is an outgrowth of a symposium organized for the 1992 annual meetings of the American Association of Physical Anthropologists held in Las Vegas, Nevada. Although it is but one of many volumes associated with the commemoration of the Columbian Quincentenary, it is distinguished from most by its emphasis on bioarchaeological evidence and its broad areal focus. With two exceptions, the chapters in this volume focus on the osteological evidence for changing patterns of health, diet, activity patterns, and levels of violent conflict stemming from contact with Europeans. In some cases, the researchers address a particular question; in others, they appeal to a wide variety of data to document general patterns of change. The studies take the reader from east to west across North America, and then southward to regions in Central and South America, as well as to the eastern reaches of Oceania. As such, this volume offers insights and new data on contacts between a number of distinct indigenous groups and the European explorers, settlers, and traders with whom they came into contact.

The volume begins with a brief but informative introductory chapter by Larsen and Milner, which serves to acquaint the reader with the unifying philosophy guiding the presentations as well as the strengths and limitations of the osteological record on which most of the studies are based. From a starting point in the southeast, the next nine chapters cover contacts between Native Americans and Europeans in North America. In Chapter 2, Hutchinson and Norr appeal to carbon and nitrogen isotope data to address questions of dietary change on the Gulf coast of Florida. In the following chapter, Larsen and Ruff use long bones dimensions and biomechanics to assess changes in physical activity associated with Spanish colonization of La Florida. Chapter 4 moves northward to the "Praying Towns" of southern New England, where Baker uses both historical and osteological data to look at the effects of contacts (with Pilgrims) and forced relocations on the health and cultural continuity of the Narragansett and other indigenous east coast groups. The health effects of contact among the Iroquoians of southern Ontario is the subject of Chapter 5, a broad osteological study by Pfeiffer and Fairgrieve of health before and after contacts with European traders, explorers, and priests. Moving westward, Chapter 6 by Reinhard *et al.* presents a study of female health among the Omaha and Ponca of Northeast Nebraska that uses several different lines of evidence, including degenerative joint disease, to document changes in workload associated with the Euro-American fur trade. Cybulski also uses osteological data in Chapter 7 to assess the health effects of trade contacts on the native peoples of the Northwest Coast, bringing a wealth of prehistoric data to bear on the question

of changes specific to European contact. In Chapters 8 and 9, health changes among southwestern Puebloan peoples are investigated. Palkovich uses historic epidemiological records to document the variable effects of Spanish-introduced diseases on different Puebloan populations, and Stodder juxtaposes prehistoric and contact period osteological data to derive a before and after picture of health in the semi-arid southwest. The last chapter on North American groups focuses on the demographic effects of European-introduced diseases on the Chumash of south coastal California, and Walker and Johnson use historic records from four Chumash missions to track epidemics during the Spanish and Mexican Periods. Although the nature of the data differs considerably between studies, it is clear that European contacts varied significantly in their purpose, nature, and effects in different regions of North America.

The sampling of contact situations outside of North America is more sporadic, but does serve to broaden the sample. Chapters 11 and 12 are both studies of the impacts of Spanish contacts on Mayan populations at trade centers in Belize. Cohen *et al.* consider a range of osteological indicators of health in a Mayan sample from Tipu, while White *et al.* look at both diet and health in Postclassic and Historic skeletal samples from Lamanai. The health consequences of Spanish exploration and settlement to the south in Ecuador are then explored by Ubelaker, rounding out the picture of Spanish impacts on New World populations. The final two chapters of the book present studies of European contacts in Oceania. In Chapter 14, Owsley *et al.* search out the osteological evidence for violent conflict, disease, and genetic admixture resulting from contacts between indigenous peoples and European mariners on Easter Island. The volume concludes with an osteological study by Pietruszewsky and Douglas on health changes in Native Hawaii consequent upon contacts with English and other European explorers.

So ends the volume, and therein lies one of my few criticisms—the absence of a concluding chapter. With such a stimulating collection of studies, a summation of where we are and a look forward to where we might go was really in order. My other criticism, which is really subsumed under the other, is the absence in all but a single study of comparative health data on contemporaneous European colonists. How can we ever come to understand the uniqueness of the Native American contact-period disease experience—arguably the most important impact of European contact—without any knowledge of how Europeans fared in this New World disease environment? These comments aside, I enjoyed this volume and highly recommend it to scholars and other readers interested in this indisputably important period of American history. □

**Paleonutrition: The Diet and Health of Prehistoric Americans.** K.D. Sobolik. Center for Archaeological Investigations, Southern Illinois University at Carbondale. Occasional Paper 22, 1994. 321 pp., 55 figures, 29 tables. \$36.00 (cloth); \$30 (paper).

*Reviewed by Lucinda McWeeney, Peabody Museum, Yale University, New Haven, CT 06520 USA*

*Paleonutrition*, published in the Occasional Paper series, is produced from the Visiting Scholar Conference held annually at Southern Illinois University at Carbondale. The 19 chapters present diverse approaches to the science of archaeology and the interpretation of paleonutrition, incorporating studies from North, Central, and South America. Each chapter in this well-edited volume presents clear figures and tables followed by its own set of references cited.

In order to present the interdisciplinary nature of archaeology and the potential and the limitations for interpreting paleonutrition, the volume is divided into five sections discussing: (1) indirect studies: paleoethnobotany and zooarchaeology; (2) coprolite studies; (3) bioarchaeology; (4) integrative studies; and (5) summary and conclusions.

The "Indirect Studies" section (meaning studies producing indirect nutritional information) discusses the weaknesses and strengths related to collecting and analyzing macro botanical and faunal samples. Included in this section are the methods developed during the last 30 years for recovering plant and animal remains. Now that the biological remnants are available, modern analytical techniques are applied to expand the interpretations of food remains found at archaeological sites. The development and intensification of agriculture provides a prime example of how the identification of food remains, along with carbon isotope analysis, can contribute to our knowledge of past cultural processes (chapter 1). The lower Illinois and central Mississippi river area discussed in Chapter 2 has benefited from extensive floral and faunal analyses. However, after two decades of collecting baseline data it is time to incorporate refined climatic variables and site selection processes into the shifting consumption patterns. For instance, a warmer, drier mid-Holocene Period may have necessitated abandonment of intermittent and shallow basin water sources. In exchange, the selection of more reliable rivers and lakes would lead to the larger nutritional contribution drawn from a wider selection of aquatic plants and animals.

Chapter 3 discusses the incorporation of small mammals into the diet of agriculturists. However, it is important to note that the use of intensive recovery techniques in the Southwest

is documenting the extensive use of small animals as far back as the Paleoindian Period. Obviously, an increasing number of archaeologists are practicing more thorough excavation and screening techniques in order to supply more diverse dietary and nutritional data on prehistoric populations.

Chapter 4 demonstrates the use of floral and faunal ubiquity percentages to interpret subsistence and social stratification at Mayan sites. However, Crane and Carr stress that this approach requires a large data base to produce valid evidence of temporal and social change. As the authors suggest, the method requires the "integration of all available evidence" to reconstruct the prehistoric diet.

Gummerman (chapter 6) extends the use of dietary resources in determining cultural specialization, exchange, and status by comparing the Chimu and Wanka from Peru to the Aztecs in Mexico. He coaxes critical values from the subsistence data and combines the results with community organization and individual roles within the systems.

Sutton presents alternative sources for dietary information in chapter 7. He reports on the discovery of animal and plant protein on milling stones and other tools. Omitted from the discussion is a new technique available to archaeologists that has frequently been utilized by wild life specialists—the retrieval of hair, which can be recovered during the flotation process. Hair can be identified and radiocarbon dated to establish the variety of animals that were available for consumption.

The section on "Coprolite Studies" provides a different approach to obtain direct nutritional data. In chapter 8, an experimental study to determine the method of food preparation used the scanning electron microscope (SEM) to record the external microstructure on corn kernels found in coprolites. Modern specimens prepared using a variety of methods were compared to the prehistoric kernels to suggest what nutrients would have been consumed.

With welcome relief, Cumming's chapter (9) provides the first measure of nutritional values, including vitamins, minerals, and electrolytes, contained in the biological specimens represented by the identified pollen and macro fossil dietary remains. She relates the archeologically obtained data found in the coprolites to symptoms of disease caused by nutritional deficiencies, and in the process validates the ability of archaeologists to correlate interdisciplinary scientific studies to produce meaningful cultural nutrition data. Bryant (chapter 10) attributes the distinction to Eric O. Callen for introducing human coprolite analysis into archaeology.

The "Bioarchaeology" section includes numerous examples of how we can obtain nutritional information from archaeologically retrieved materials. Powell and Steele (chapter 12) describe how human dentition and wear gradients can provide indicators for the types of foods consumed. However, the number of caveats, small sample size and their



temporal extension into the Holocene for their "Paleoindian" component detract from their results. An over-generalization of radical climatic fluctuations and changing environments during the late-Pleistocene when Paleoindians populated North America provided an incomplete "framework" for making comparisons between Paleoindian remains dating to the Early Holocene and Archaic populations. Their dental analysis methods may be appropriate, but their environmental foundations were inaccurately laid.

Bourque and Krueger provide an excellent synopsis (chapter 13, p. 206) on the valuable use of isotopic analyses on bone to assist in dietary reconstruction. Reed stretches the application of stable carbon and nitrogen isotope ratios to recognizing social status, sex, and age in Copan (chapter 14). Larsen and Harn (chapter 15) followed by Armelagos (chapter 16) address what can be learned about nutrition from hard tissue (bone) pathology. The "Integrative Studies" section demonstrates how an amalgam of resources can substantially contribute to our knowledge of prehistoric health and diet as well as social and cultural processes.

*Paleonutrition: The Diet and Health of Prehistoric Americans* is an exemplary volume of collected essays on how to determine and assess foodways and health for prehistoric populations. The first few chapters imply that it may be unrealistic to obtain food values from a biased recovery sample and then to equate that sample with an understanding of paleonutrition. However, by the end of the volume, the potential is clear; we can obtain nutritional information if we employ the multitude of described scientific techniques. This book will be of great value for paleoethnobiology courses and introductory method and theory courses covering floral and faunal analyses for archaeology. □

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**Whither Environmental Archaeology?** Rosemary Luff and Peter Rowley-Conwy (eds.). Oxbow Books, Oxford, England, 1994. 212 pp. £32 (paper).

*Reviewed by Mark Nesbitt, Institute of Archaeology, University College London, London WC1H 0PY, U.K.*

This book originates in a conference held in Cambridge, England in 1990, on the topic of integration of environmental archaeology with other aspects of archaeology. A conference report by Delwen Samuel appeared in *SAS Bulletin* 14(2): 5-6. The whole question of integration is one that is endlessly discussed amongst archaeological scientists. We all agree that it is highly desirable because it makes our work much more

effective—and much more personally satisfying. So, why is it that so much bioarchaeology—especially that carried out as part of salvage archaeology—is characterized by poor recovery of ecofacts in the field, their study in intellectual (and often physical) isolation from other key members of the excavation team, and publication typically as appendix 132, usually on microfiche?

The editors of this book offer one perspective in an entertaining, but all too short, introductory chapter that should be compulsory reading for all archaeology students. They draw a contrast between two types of excavation director: the *Grand Seigneur*, who believes that only he (and it is usually a "he") is a real archaeologist, and therefore that he should plan and carry out the excavation with no input from "specialists," whose only role is to provide a set of appendices to pad out the final publication. In contrast, the *Primus inter Pares* (first among equals, or PIP) project director sees "specialists" as archaeologists who contribute to the planning and execution of the field project, and who work together—most crucially at the level of pre-publication meetings—to jointly author excavation reports. The aim of this book is to "exemplify and encourage this trend towards PIP-type project management." How well does this book achieve these aims, and how likely is it to be read by anyone except practicing archaeological scientists?

There are three parts to the book. The first part contains seven case studies of bioarchaeological input into archaeological projects. These range widely, from designing a database for animal bones, and phytolith analysis in the Outer Hebrides of Scotland, to the taphonomy of cooked bone. Most of the papers sit uneasily in a book on integration: they approach purely bioarchaeological research questions from a methodological viewpoint, rather than addressing wider archaeological questions. However, some papers raise issues that reappear later on. For example Peter Rowley-Conwy, in his paper on the deposition of desiccated plant remains at Qasr Ibrim in Nubia, picks up on a theme—unraveling site formation processes—that is an underlying topic of about half the papers in this volume.

The second part of the book features four papers by bioarchaeologists who acted as site directors. The first two papers are, again, straight bioarchaeological reports that deal with the invertebrate remains from an Icelandic midden, and a comparison of hand-picked and wet-sieved bone samples from a cave site in Greece. The two other papers are more directly relevant to the theme of the book: well-written accounts of the problems and successes of two excavations, that place them within the context of changes in the policies of British salvage archaeology in the last twenty years. Francis Green and Kris Lockyear grapple with the dynamics of pottery and seed deposition in a medieval town, while Mark Robinson reveals the true story behind the publication, 15 years on, of a small Iron Age site near Oxford.

It is the third and final part of the book that contains the real food for thought: three substantial multi-authored accounts of integration at three major archaeological projects. I was intrigued by the way the presentation in these three papers reflected some of the problems of integration in archaeology. In the first paper, by S.J. Dockrill *et al.*, six different analytical techniques are applied to a sequence of buried soils at a Bronze Age site in Scotland: phosphate analysis, soil micromorphology, identification of molluscs, stable carbon isotopes, and identification of faunal and botanical remains. An interesting range of techniques is applied to the question of whether the soils were cultivated, but the lack of integration between them and, most critically, the lack of any information on the provenance of the samples studied by each specialist (each of whom uses a different numbering system), left me a frustrated reader. A section drawing showing where each sample comes from is badly needed—as is a conclusion that integrates and compares the results from each technique. With effective editing this paper would have been much more convincing—and the reader would be spared the frequent infelicities of phrasing, misprints (some serious, e.g. maize as a C3 plant on page 125), and the type of incomplete and inconsistent references that mar many other papers in this volume.

Next, Barry Kemp, Delwen Samuel and Rosie Luff explore state-household relations in food supply at the ancient Egyptian city of Tell el-Amarna. There is a curious structure to this tripartite paper: firstly, Barry Kemp, the excavation director, offers a fascinating and masterly survey of the question, using textual, artifactual, botanical and zoological evidence to show that supply of provisions was channeled through a complex mix of state and private sources. This substantial paper—which contains ideas and approaches to data that will interest anyone else working on food supplies in complex societies elsewhere—is then followed by two shorter, separate contributions authored by the archaeobotanist and zooarchaeologist at the site, repeating data and conclusions already extensively presented in the first section. It is not at all clear why this is not just one multi-authored paper, rather than three separate ones.

The final paper in the book is the longest and by far the best—and the main reason I would recommend that all archaeological libraries should buy this book. Wendy Matthews and Nicholas Postgate integrate results from excavation, systematic quantified recovery of bones and charred plant remains, and soil micromorphology to understand spatial patterning at the Bronze Age Mesopotamian site of Abu-Salabikh. This is a very clearly written demonstration of how a carefully thought-out sampling program can be designed to answer wider archaeological questions, as well as ensuring recovery of economic data on plant and animal husbandry. This is also the first extensive publication of Wendy Matthews' innovative work on soil micromorphology

as a tool for characterizing use of space. This paper will not just be of interest to many excavators—especially those digging mudbrick sites—in any part of the world, but would also be an excellent example for students of a well-integrated approach to excavation and publication.

By now, you will have gathered that I don't think this book quite hits the spot: it contains many good things, some of which deserve a wide circulation, but I fear that the diverse, rather diffuse nature of the subject matter of the papers, combined with a less than charismatic title (and cover) for the book as a whole will put off many readers. This would be a real shame: the first paper and the last two in the volume are highly stimulating and should be influential beyond the world of bioarchaeology. Do get your library to buy this book—and do read those papers. □

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**Soils in Archaeology: Landscape Evolution and Human Occupation.** Vance T. Holliday (ed.). Smithsonian Institution Press, Washington, DC, 1993. 272 pp. \$16.95 (paper).

*Reviewed by William D. Middleton, Department of Anthropology, Laboratory for Archaeological Chemistry, University of Wisconsin, Madison WI, 53706*

Vance Holliday's edited volume joins the small corpus of works dedicated to various archaeological applications of soil science (e.g. Cornwall 1958; Courty *et al.* 1989; Groenman-van Waateringe and Robinson 1988; Keeley and Macphail 1981; Limbrey 1975). As such, it ranks as an important contribution to this small but growing body of literature, although it would still be an important addition even if the literature were more extensive. The work is the proceedings of the first Annual Fryxell Symposium held at the Society for American Archaeology meeting in Phoenix, Arizona in April 1988.

The sub-title, "Landscape Evolution and Human Occupation," is slightly misleading. With the exception of Stein's contribution (discussed below), the contributions concentrate almost exclusively on landscape evolution (geomorphology). Human occupation enters into the contributions more as occupation on an evolving landscape and the implications of geomorphological processes for archaeology than as site-based archaeological soil analysis as an adjunct to behavioral interpretation (e.g. Barba and Ortiz 1992; Heidenreich and Konrad 1973; Manzanilla and Barba 1990). The title implies a broader orientation than it actually presents, which may disappoint some readers: the reviewer has recently noted a comment on an Internet discussion group expressing disap-

pointment that the work was so heavily geomorphologically oriented. While this is not really a flaw, it does point to the need for a broader consideration in the near future.

The book is emphatically not a handbook or manual, but neither is it merely a collection of case studies. Rather, each contribution considers a specific issue or approach and its implications for archaeology with illustrative case studies. Issues considered include geomorphological factors affecting site formation and location, the integration of geomorphological studies with regional (site) survey, the use of soil chronosequences in dating sites, paleoecological reconstruction, anthropogenic and natural organic matter in soil formation, and the effects of agricultural terracing on soil formation.

The work comprises eight articles: "Alluvial Pedology and Geoarchaeological Research" by C. Reid Ferring; "Soils and Holocene Landscape Evolution in central and Southwestern Kansas: Implications for Archaeological Research" by Rolfe D. Mandel; "Soil Formation, Time, and Archaeology" by Vance T. Holliday; "Soil Morphological Properties and Weathering Zone Characteristics as Age Indicators in Holocene Alluvium in the Upper Midwest" by E. Arthur Bettis III; "Micromorphology, Soils, and Archaeological Sites" by Paul Goldberg; "Soil Properties of Sediments in Wadi Feiran, Sinai: A Geoarchaeological Interpretation" by Bruce G. Gladfelter; "Organic Matter in Archaeological Contexts" by Julie K. Stein; "Long-term Effects of Prehistoric Agriculture on Soils: Examples from New Mexico and Peru" by Jonathan A. Sandor; and a very useful glossary by Holliday and Goldberg. It is well written, illustrated, and edited. The authors employ a variety of technical and methodological approaches in their contributions, but for the most part these are not discussed in detail. Each article, however, is well referenced, so the interested reader can easily pursue more information on a particular approach.

The first six contributions focus on pedologic and geomorphic aspects of landscape (and site) formation and their contingent ramifications for archaeological interpretation. A recurrent theme is the lack of precision in the archaeological use of the terms "soil" and "sediment" (also very well covered in Stein's contribution), and the confusion resulting from their imprecise use. To briefly summarize, in pedological terminology a sediment is a particulate matter deposited by some agency (wind, water, etc.) and a soil is the weathered product of a sediment. A key point, well made by Ferring, Holliday, and Gladfelter, is that a soil can only develop on a stable land-surface because soil formation takes time; sedimentation on the other hand can occur at any rate. A soil, therefore, always indicates a stable land surface, but the absence of a soil does not, conversely, indicate that there was no land surface. Failure to clearly distinguish between the two

can greatly complicate the interpretation of stratigraphic and chronological sequences.

As Ferring, Holliday, and Gladfelter point out, artifacts at a single component site can be vertically dispersed with little evidence of stratification if there is continuous sedimentation, while artifacts at a multi-component site can all be superimposed on the same surface if there is a period of extended landscape stability. The ability to recognize the depositional environment is extremely important in either case.

An important, related point is that various surfaces within a landscape can be of different ages as the result of differential action by geomorphic forces (erosion, sedimentation, glaciation, etc.). Both Mandell and Bettis discuss the implications for regional site survey: whole stretches of prehistory may be out of reach to anything but accidental discovery because the contemporary land surface has been buried beneath more recent sediments or soils or has been eroded. Regional surveys must take this into account when interpreting their results. Once they have been correlated, however, different soils (both buried and surface) can be used to date sites, predict their location, and identify areas where surface survey will be unprofitable.

Goldberg discusses the use of soil micromorphology in distinguishing between various geomorphic and pedogenic processes impacting site formation. These range from identifying sources of sedimentary material, to distinguishing between soils, sediments, and anthropogenic features. An understanding of these factors is extremely important for interpreting stratigraphic relationships and determining the integrity of deposits.

Each of the final two contributions stands somewhat apart from the preceding six. Stein presents an excellent discussion of organic matter in archaeological sites. In addition to mechanisms of accumulation and degradation of organic matter, she offers a very clear discussion of the distinction between sedimentary and pedogenic organic matter and between soil and sediment. Sandor reviews the effects of agricultural terracing on pedogenesis and demonstrates how pedological investigations can aid in the interpretation of these features.

Taken together, this collection presents a very good picture of the geomorphology side of geoarchaeology. Given the scope of its title, though, it is unfortunate that the contributions were not more diverse. The issues covered, however, are significant. It is the reviewer's impression that many of these issues are not widely appreciated by many archaeologists, and for this reason the book is especially important. Most archaeologists would profit by reading it, especially the contributions by Ferring, Holliday, Goldberg, and Stein.

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## Report from the Chair for Electronic Communications

In 1991 the Society for Archaeological Sciences set up an electronic-mail network for archaeometry, SASnet, which was run by Foss Leach at the National Museum of New Zealand. SASnet was established to discuss archaeological applications of methods from the physical sciences and to provide rapid communication among archaeometrists and archaeologists. It's intended to provide a resource for archaeologists who need access to technical expertise and a forum for physical scientists to discuss the development of archaeological applications of their methods. News about relevant current events, seminars, publications, and employment is welcome.

This spring, at Foss's request, I assumed responsibility for SASnet and moved the mailing list to the University of Wisconsin's mail server. Although they might not be readily visible to SASnet users, several changes were made to the structure of SASnet. As before, mail to SASnet is distributed to everyone on the entire mailing list. One significant change is that replies to SASnet messages no longer go just to the individual who posted the original message, but to the entire mailing list. This change was made to facilitate active and ongoing electronic discussion. A second change is that SASnet

is now open to those who are not members of the Society for Archaeological Sciences, but who have an interest in archaeometric issues. This open-door policy is intended to increase interaction between archaeometrists and those not trained in physical sciences but who need access to archaeometric expertise. Although this change has not been broadly announced, I am actively soliciting the participation of archaeologists, as well as geologists, chemists, and others who are not (at the moment!) SAS members, but who may have considerable interest in archaeometry and, hopefully, in the SAS as well.

Those who have much experience with electronic mailing lists are familiar with some of the problems (e.g., "spams" and "flame wars") to which they are prone. A significant aspect of SASnet, however, is that it is configured as a "moderated" list. I.e., all mail to SASnet is screened before forwarding it to the entire list. While appropriate discourse is distributed without alteration or delay, irrelevant advertising, unduly abusive messages, and mail sent to SASnet by accident can be returned to the sender without being sent to the entire list.

Instructions for joining (or leaving) SASnet have also changed. To subscribe, send the following command: "subscribe SASnet <your name>" via e-mail to the list server address: listserver@relay.doit.wisc.edu. A list of instructions will be sent to you with your subscription confirmation. If you would like a listing of available user commands, send an e-mail to: listserver@relay.doit.wisc.edu. The contents of your e-mail should contain one word: "help."

Thanks to the courtesy of the University of Wisconsin's Department of Information Technology ("DoIT") and the Department of Anthropology, the Society now has space available on the university of Wisconsin computer system for web pages. I am setting up some web pages for the SAS at <http://www.wisc.edu/anthropology/sas/sas.htm>. These include some e-mail links to the SAS membership, to archaeometric facilities, publications, and other resources. I have tried in these pages, for the most part, to keep "Netscapisms" to a minimum so that the documents correctly appear on a wide variety of computer systems and web browsers. If anything appears to be strange (other than perhaps my home page) or if links are not working, please notify me and include information on how you are viewing the pages.

Also, if you are a SAS member and your e-mail address is not on the membership list but you wish it to be, please contact me. Any other questions, concerns, or comments about either SASnet or the SAS-WEB pages should be sent to my e-mail address below. Feedback on both will be appreciated.

James Burton, Associate Director, Laboratory for Archaeological Chemistry, Department of Anthropology, University of Wisconsin, Madison WI 53706-1393, USA; tel: 608-262-4505; fax: 609-265-4216; e-mail [jhburton@facstaff.wisc.edu](mailto:jhburton@facstaff.wisc.edu) □

## Garman Harbottle Awarded Seaborg Medal

Awarded initially in 1984 to Dr. Glenn T. Seaborg, the American Nuclear Society Seaborg Medal honors excellence in research achievements on the part of an individual which have been especially beneficial to the development of the peaceful uses of nuclear energy.

This award is given to individual members of the international scientific community rather than to a team or to an institution. It honors excellence in technical achievements worthy of international recognition that have been sustained over a period of time. Nominees should reflect a high degree of scientific acumen, imagination and unusual talents in scientific research. Thus, nominees should have made significant contributions to the scientific basis for a wide variety of peaceful applications of nuclear technology. Further, candidates should be held in high esteem by peers engaged in the important task of nuclear research.

The letter notifying Dr. Harbottle of the honor reads as follows:

"It is my pleasure to advise you officially that you have been selected to receive the 1995 Seaborg Medal of the American Nuclear Society (ANS). As you know, the Seaborg Medal is one of the most prestigious awards that the Society can make. I would like to offer you my own personal congratulations at this time.

"The award will be presented at the 1995 ANS Winter Meeting in San Francisco, CA at the Awards Luncheon on October 31, 1995. Further details will be sent to you from ANS headquarters."

The award is in the form of an engraved medal. It was presented during the ANS Winter Meeting in San Francisco in November 1995. This was the ninth presentation of this medal.

Past recipients of the Seaborg Medal are:

- 1984 - Glenn T. Seaborg
- 1985 - Manson Benedict
- 1986 - Robert Avery
- 1987 - David Okrent
- 1988 - Leo Yaffe
- 1989 - Henry Hurwitz, Jr.
- 1990 - Yoshitugu Mishima
- 1991 - Not Awarded
- 1992 - Richard T. Lahey, Jr.
- 1993 - Not awarded
- 1994 - Not Awarded
- 1995 - Garman Harbottle

□

## Norman Herz Awarded Pomrance Science Award

Professor Norman Herz of the Department of Geology, University of Georgia, was presented the fifteenth annual Pomrance Award for Scientific Contributions To Archaeology of the Archaeological Institute of America for his work in light stable isotopes. The award was given during the Awards Ceremony at the Archaeological Institute's 97th Annual Meeting at the San Diego Marriott and Marina, San Diego, California, on December 29, 1995. The award is given annually and recognizes the interdisciplinary assistance of scientists to the advancement of archaeological research. The Archaeological Institute's First Vice-President, Professor Nancy Wilkie of Carleton College, presented the award. The citation reads as follows:

"Norman Herz has made a great contribution to archaeological science through his studies of the ratios of light stable isotopes (particularly those of carbon and oxygen) in marble and limestone quarries of the Mediterranean. This technique has proven to be an invaluable aid to studies of the authenticity and provenance of classical statuary and architecture carved from these rocks. Herz's generosity and activism have brought together scholars from many disciplines and so enriched their research and all archaeology.

"The ratios of the oxygen and carbon isotopes are fixed in limestone at formation. Isotopic ratios are less variable across a quarry field than is chemical composition, and hence are a more reliable indicator of source. Intensive sampling of quarries by Herz and others has shown some overlap of isotope ratios, so other techniques such as optical petrography and cathodoluminescence must often be employed to distinguish reliably between sources. But stable isotope ratio analysis remains the technique of first resort because it is inexpensive and causes the least damage to art objects. When Norm Herz first began these studies, he needed a sample equal to a pencil lead; now he needs only a volume equivalent to the pencil point.

"Isotopic analysis has resolved some knotty archaeological problems. One puzzle has been how the sloping galleries on Paros could have produced all the sculpture putatively identified as Parian around the Mediterranean. Recently, other large opencast quarries with a distinct isotopic signature ('Paros-2') have been correlated with many of these samples, as for example the marble blocks at Ostia inscribed with mid-second century dates. Paros-2 is evidently the source for much of the Parian marble used in the High Empire: problem solved.

"Norm Herz has carried out many analyses for field projects and museums. He proved the Antonia Minor portrait in the Fogg Art Museum to be a pastiche of unrelated Parian and Carrara statues. A Livia head in the Ny Carlsberg Glyptotek had an original Parian head but skullcap of Ephesian marble; capless, Livia became Agrippina the Elder. The unique Jonah statuettes in the Cleveland Museum of Art

are of Dokimeion white marble, which gives an archaeological basis for the observed stylistic kinship with Dokimeion sarcophagi. Recently Norm has studied the Getty kouros, with results well known to many here.

"Herz's interest in archaeology began early in his career. One paper, coauthored with the young Colin Renfrew, attacked visual identification of Aegean marbles and drew a heated response from Bernard Ashmole. In the early 1970s Norm began work on stable isotopes, and in 1984 he established the Center for Archaeological Sciences at the University of Georgia. Norm's data base of quarry samples is the largest compiled, but its influence outpaces its size because he shares it freely.

"In 1988 Norm organized a conference that attracted geologists, chemists and physicists, museum curators and conservators, historians, art historians, and archaeologists. Here was born ASMOSIA (Association for the Study of Marble and Other Stones in Antiquity), with subsequent meetings held at Louvain (Belgium) in 1990, Athens (1993), and Bordeaux (1995). The publications are now central to marble studies, and between meetings Norm keeps the information flowing with a witty newsletter. Thus, Norm's influence extends far beyond his own research. For this record of individual accomplishment, service, and inspiration to others, the AIA is proud to confer the Pomerance Award for Scientific Contributions to Archaeology upon Norman Herz." □

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## Positions Open

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### Assistant Professor

The Department of Anthropology, University of Georgia, wishes to fill a new, tenure-track, beginning Assistant Professor position, beginning Fall 1997. To strengthen our program in ecological/environmental anthropology we seek an individual whose training and research interests are in human population ecology, contemporary or historical. Specializations may include the interrelationships of population, environment, and resources; evolutionary and human genetic issues; human reproductive ecology; anthropological demography; or proximate/ultimate causes of human fertility and mortality. Responsibilities include research and teaching at the graduate and undergraduate levels, incl. a holistic Intro. to Anthropology with a strong human/environmental component. Ph.D. must be in hand at time of appointment. We will conduct preliminary interviews at the AAA meeting in November. Applicants should send a CV, cover letter, and names and contact information for 4 references to: Stephen A. Kowalewski, Dept. of Anthropology, University of Georgia, Athens, GA 30602-1619, by January 10, 1997. The University of Georgia is an EEO/AA institution. We especially encourage minority and women applicants.

## NERC Ph.D. Studentship

THE UNIVERSITY OF SHEFFIELD  
Department of Archaeology and Prehistory  
NERC PhD Studentship

Applications are invited for a NERC studentship in this research-active Department. The award, which must be commenced before 31st December 1996, will be for up to 3 years, leading to the degree of Ph.D in the following subject:

Production and consumption of pottery in Early Neolithic Crete: a petrographic and microstructural approach.

The project will develop and exploit a combination of petrographic analysis and scanning electron microscopy to elucidate the technology and location of the first pottery production in Crete, that of the Early Neolithic period. The work will be based on the substantial pottery assemblage of Knossos, and will build on that of our active research team investigating Late Neolithic and Early Minoan ceramics. The student will have the opportunity of being trained in both petrographic and SEM techniques at Sheffield and NCSR "Demokritos" in Greece. The organization of production, the features of an early, introduced technology and the social context of consumption of these vessels are anticipated as important themes in the work. Further details may be obtained from Dr Peter Day or Dr Louise Joyner (Tel: 0114 282-5028/5030. Email p.m.day@sheffield, or by post to The Department of Archaeology and Prehistory, University of Sheffield, Northgate House, West Street, Sheffield, S1 4ET). The closing date for applications is 29th November 1996 and interviews will take place in the first week of December. □

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## Meetings Calendar (cont.)

1997

Dec. 1-5. Materials Research Society, Fall Meeting. Boston, Massachusetts, USA. Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237, USA; tel: 412-367-3003; fax: 412-367-4373.

1998

\* July 26-Aug. 2. The 21st Century: The Century of Anthropology. 14th Congress of the International Union of Anthropology and Ethnological Sciences. The College of William and Mary, Williamsburg, Virginia, USA. Tomoko Hamada, 14th ICAES Executive Secretary, Dept. of Anthropology, college of William and Mary, Williamsburg, VA 23187-8795, USA; tel: 804-221-1055, fax: 804-221-1066; email thamad@mail.wm.edu. □

## Meetings Calendar

*Susan Mulholland, Archaeometry Laboratory, University of Minnesota-Duluth, 10 University Drive, Duluth MN 55812, USA; tel: 218-726-7957; fax: 218-726-6979; email: smulholl@ua.d.umn.edu*

New listings are marked by an \*; new information for previous listings indicated by a +. More information on some meetings is given in previous bulletins as indicated, e.g., "12(4):13" for volume 12, number 4, page 13.

### 1996

- \* Nov. 14-17. 29th Annual Chacmool Conference. "The Archaeology of Innovation and Science." Catherine Christensen, 1996 Conference Committee, Dept. of Archeology, University of Calgary, Calgary, Alberta, Canada T2N 1N4; fax: 403-282-9567; email: 13042@ucdasvm1.admin.ucalgary.ca
- Nov. 20-24. American Anthropological Association Annual Meeting. San Francisco, California, USA. American Anthropological Association, 4350 North Fairfax Drive, Suite 640, Arlington, VA 22203, USA; tel: 703-528-1902.
- \* Nov. 22. "Toward More Efficient Dissemination of the 'Big Picture' Ideas from Southwestern Anthropology and Archeology". Phoenix, Arizona, USA and on the World-Wide Web. Brian Kenny, Conference Chair, Maricopa County [MCDOT/TPD]. 2901 West Durango, Phoenix AZ 85009, USA; tel: 602-506-8082; fax: 602-506-4882; email: kenny@planning.mcdot.maricopa.gov; web: <http://seamonkey.ed.asu.edu/swa/>
- Dec. 2-6. Materials Research Society Fall Meeting. Boston, Massachusetts, USA. Materials Research Society, 9800 McKnight Road, Pittsburgh, PA USA; tel: 412-367-3003; fax: 412-367-4373. The 5th symposium in Materials Issues in Art and Archaeology will be held at this meeting.

### 1997

- unknown. Millennial Observance of Viking Invasion of 997. Tavistock, West Devon, England. Julian Barnicoat, 10 Cuxton Meadows, Buckland Monachorum, Yelverton, Devon, PL20 7NG, UK.
- \* unknown. The Earliest Paleart: A World Perspective. International Federation of Rock Art Organizations. R.G. Bednarik, IFRAO, PO Box 216, Caulfield South, Vic. 3162, Australia. OR P.G. Bahn, 428 Anlaby Rd., Hull HU3 6QP, United Kingdom.
- \* Jan. 8-11. Joint Mathematics Meetings: 103rd Annual of American Mathematical Society, 80th Annual of Mathematical Association of America, Associate for Women in Mathematics, National Associate of Mathematicians. San Diego, California, USA. Mathematics Meetings Service Bureau, P.O. Box 6887, Providence, RI 02940, USA; tel: 401-455-4143 or 1-800-321-4267 x4143.
- \* Feb. 2-7. 6th Symposium on Education, American Meteorological Society. Long Beach, California, USA. "Atmosphere and Oceanographic Education - Teaching about the Global Environment." David R. Smith, Oceanography Dept., U.S. Naval Academy, 572 Holloway Road, Annapolis, MD 21402, USA; fax: 410-293-2137.
- Feb. 10-13. Australasian Archaeometry: Retrospectives for the New millennium, 6th Australasian Archaeometry Conference. Australian Museum, Sydney, Australia. Secretariat, 6th Australasian Archaeometry Conference, AINSE< PMB 1, Menai NSW 2234, Australia; tel: 61-2-439 8220; fax: 61-2-439 6561; email: tuniz@atom.ansto.gov.au.
- \* April 1-6. International Rock Art Congress. Cochabamba, Bolivia. Matthias Strecker, Secretary-General, Sociedad de Investigacion del Arte Rupestre de Bolivia, Casilla 3091, La Paz, Bolivia.
- April 2-6. Society for American Archaeology, Annual Meeting. Opryland, Nashville, Tennessee, USA.
- SAA, 900 Second St. NW, Suite 12, Washington, DC 20002, USA; tel: 202-789-8200.
- April 7-11. Materials Research Society, Spring Meeting. San Francisco, California, USA. Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237, USA; tel: 412-367-3003; fax: 412-367-4373.
- \* June 4-7. Symposium on Bison Ecology and Management. Bozeman, Montana, USA. Bison Symposium, Montana State University, 235 Linfield Hall, Bozeman, MT 59717, USA; tel: 406-994-3414.
- \* July 21-25. Inter-Congress of the International Union of Anthropological and Ethnological Sciences and 21st Meeting of the Human Genetics Society. Fremantle, W.A., Australia. Theme: Human Genetics: Diversity and Disease. Alan H. Bittles, Dept. of Human Biology, Edith Cowan University, Joondalup Campus, Perth, W.A. 6027, Australia; email: A.Bittles@cowan.edu.au.
- \* July 28-Aug. 1. GeoSciEd II: 2nd International Conference on Geoscience Education. University of Hawaii at Hilo. M. Frank Watt Ireton, American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009, USA; email: fireton@kosmos.agu.org.
- August 28-Sept. 3. IV International Conference on Geomorphology. Bologna, Italy. IV International Conference on Geomorphology, Planning Congressi s.r.l., Via Crociani 2, I-40138 Bologna, Italy.
- Sept. 8-12. 12th International Numismatic Congress. Berlin, Germany. Staatliche Museen zu Berlin -Preufischer Kulturbesitz, Munzkabinett, Bodestrafe 1-3, D-10178 Berlin, Germany.
- Oct. 20-23. Geological Society of America, Annual Meeting. Salt Lake City, Nevada, USA. Vanessa George, Geological Society of America, 3300 Penrose Place, Boulder, CO 80301, USA; tel: 303 -447-2020; tax: 303-447-1133.

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