



SAS Bulletin

Society for Archaeological Sciences

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From the President

I'd like to thank the SAS membership for electing me to the presidency, or more precisely, for not voting against me as president-elect two years ago. I took over

the reigns from Past-President Pat Martin after our business meeting at the recent Society for American Archaeology meeting in Nashville. Pat's able efforts made it easier for me to step into his shoes when I succeeded him as editor of the *SAS Bulletin* several years ago. I expect to similarly benefit from Pat's experience and advice as I now follow him into the presidency.

I have been a member of the SAS since 1980. (As a graduate student, it was the second professional society I joined.) My own research interests have involved archaeomagnetism and archaeomagnetic dating, geophysical prospection, and radiocarbon geophysics. My work in archaeomagnetism has convinced me that the best archaeometric work always develops as a result of carefully cultivated collaborations between archaeologists and natural scientists. I have been fortunate to find a home for my interdisciplinary interests as a professor at a liberal arts college, and I've always been grateful that my colleagues at Franklin & Marshall tolerate me despite the fact that I'm not an earthquake seismologist. Archaeometry is not always enthusiastically endorsed in the discipline-bound confines of academia: the existence of groups like the SAS are important for the support they give to the work that we do.

Besides being a long-time member, my experience in the SAS has been as assistant secretary-treasurer (1988-1990), secretary-treasurer (1990-1991), associate editor of the *Bulletin* (1987-1991, meetings calendar), editor of the *Bulletin* (1991-1995), and president-elect (1995-1997). I have thus had the opportunity to see many facets of our society's operations, and to work with many fine officers and Bulletin personnel past and present.

I have several goals for the SAS that I would like to see accomplished during my tenure as president:

- (1) To preside over the next two meetings of the SAS at the annual meetings of the Society for American Archaeology. As a geoscientist with other meetings to attend, I have not in the past attended this meeting every

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From the Editor

This is, of course, the first *Bulletin* that I have produced since being appointed Editor earlier this spring; since 1991 I have been the Book Review Editor. I am planning to quickly get our quarterly publication back on schedule, with another double-issue (1997 no. 1/2) to come out in July, and then numbers 3 and 4 in October and January respectively.

I have created some new editorial positions, and brought on board a number of new colleagues to serve as Associate Editors. I thank Chris Nagle, Jim Ebert, Mark Nesbitt, Delwen Samuel, Joe Lambert, and Robin Burgess for their past efforts, and welcome Charlie Kolb (Archaeological Ceramics); Carl Heron (Archaeological Chemistry); David Landon and Linda Scott Cummings (Bioarchaeology); Richard Evershed (Biomolecular Archaeology); Michael Glascock (Book Reviews); Donna Kirner and Jack Rink (Dating); and Apostolos Sarris (Remote Sensing and GIS) as new Associate Editors. Martha Goodway (Archaeometallurgy) and Sue Mulholland (Meetings Calendar) continue their long history of *Bulletin* service.

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☛5/8-03/8-N/L/8-L-0-V5/8/8/R/N0H/305/80;

year. Minutes of our business meetings will be published in the *Bulletin*, and made available through our web site.

- (2) To see that the business of the society is conducted according to the by-laws in an orderly and timely fashion. I look forward to working with Rob Tykot to get the *SAS Bulletin* back on track as the only regularly published bulletin/newsletter covering the entire field of archaeometry. Annual reports of our vice presidents will be published in the *Bulletin* and on our web page along with our budget.
- (3) To work with members of the executive board to give our society a greater visibility in the publications and at the meetings of related organizations.
- (4) To have at least one SAS-sponsored symposium at every SAA meeting.
- (5) To make our society more international, through membership, composition of the executive board and of the *Bulletin* editorial board, and involvement in international meetings such as the Archaeometry Symposium
- (6) To support the infrastructure of archaeometry, through development of further volumes in the Plenum Press series on *Advances in Archaeological and Museum Science*, encouragement of students of archaeometry, and discussions concerning the teaching and funding of archaeometry.

I have found my SAS associates to be among the colleagues I most enjoy seeing at the professional meetings I attend. Good people make for a good society! I look forward to working with officers, editors and members alike to strengthen our society during the next two years.

Rob Sternberg

May 5, 1997

SAS Web Page Active

The World Wide Web page for the Society for Archaeological Sciences is now active, thanks to the efforts of James Burton, a past president of the SAS. The URL for the page is: <http://www.wisc.edu/anthropology/sas/sas.htm>

The SAS page includes membership information; e-mail addresses of SAS members; instructions for joining SASnet, our society's discussion list; text from recent issues of the *Bulletin*; and details of our *Advances in Archaeological and Museum Science* series with Plenum Press. The New and Noteworthy page has information on recent and future conferences, including the abstracts from the last Archaeometry Conference and registration materials for the next one. The SAS page also has links to other archaeological publications; to archaeometry laboratories and facilities; to other archaeological societies; and to agencies funding archaeometric research. Bookmark it and put a link to it on your page!

31st International Symposium on Archaeometry

27 April - 1 May 1998

Hungarian National Museum, Budapest, Hungary

WWW: <http://origo.hnm.hu/ametry98/>

E-mail: h5852bi@ella.hu

Abstracts due November 1, 1997

☛3/80N/L0R/1/8-L-0-V5/8/8/R/N0H/305/80;

In addition to our usual conference and book reviews, meetings calendar, and Martha's archaeometallurgy column, I anticipate having regular columns from all of the Associate Editors, and short articles and news items concerning archaeological science. I want to emphasize too that we need your help. The SAS is an international organization with members in more than 30 countries; I ask all members, but especially those of you living outside the United States to please send your news and comments to the appropriate Associate Editors (contact information on the back cover). We look forward to your suggestions for book reviews and to timely information about conferences, university programs, employment opportunities, archaeology laboratories, and research projects.

For your information, I am an assistant professor in the Anthropology Department at the University of South Florida, where the importance of scientific applications in archaeology is well respected. Our graduate and advanced undergraduate students receive hands-on experience in laboratory methods, and learn to integrate scientific evidence with that obtained from fieldwork and library research. My colleagues in archaeology/anthropology as well as in geology, geography, biology and other departments have strongly encouraged interdisciplinary projects, and the university has provided me with my own laboratory space and the equipment necessary to conduct my research (elemental and isotopic analysis of materials for characterization, provenance and/or dietary information). I know this is not the typical situation within American universities or in certain other countries, but with the help of organizations like SAS, archaeological science is becoming more mainstream. The publication of the *Bulletin* increases our visibility and recognition and I look forward to working with the editorial staff to produce a useful and informative *Bulletin* that will help the SAS meet its professional goals.

Robert H. Tykot

May 16, 1997

Deadlines for Submissions

No. 1: March 1

No. 3: September 1

No. 2: June 1

No. 4: December 1

Archaeological Ceramics

Charles C. Kolb, Associate Editor

This new column will contain news about archaeological ceramics, ceramic ethnoarchaeology, ethnoceramic studies (ethnographic and ethnohistoric), laboratory studies about ceramic materials, and method and theory, among other relevant topics. The column will include information about important publications; reviews of books and monographs; notices about recent and forthcoming conferences, symposia, and seminars; requests for assistance and information; employment opportunities; and other salient information. In order for this incipient enterprise to be successful, I urge you to send relevant information to me (address on back cover). Hard copy or e-mail submissions are preferred.

Meetings

The 62nd annual meeting of the Society for American Archaeology was held from 2-6 April 1997 at the Opryland Hotel in Nashville, TN. There were at least 71 papers presented which dealt with ceramic analyses, archaeological ceramics, ceramic ethnoarchaeology, and/or ceramic chronology. A major topical trend represented among the papers was the chemical sourcing of ceramics. The results of INAA and chemical sourcing research on obsidian and ceramics conducted at the University of Missouri's Research Reactor featured notably in many presentations: Hector Neff was the author or coauthor of ten papers while Mike Glascock was the coauthor of six presentations. Donna Glowacki (Crow Canyon) organized a nine-paper symposium entitled "Chemical Sourcing of Ceramics in the Greater Southwest." Ron Bishop and Eric Blinman served as the discussants.

The 1997 SAA "Award for Excellence in Ceramic Studies," conferred annually since 1994, was awarded to Ron Bishop (Smithsonian Institution-Conservation Analytical Laboratory) and James Hill (U. of Arizona). Ron was recognized for his work in establishing the research design for INAA of ceramic materials which set the standard for provenience studies. Jim Hill's award recalled his studies on ceramics from Broken K Pueblo and the use of material culture in the study of ancient social organization. An SAA "Presidential Recognition Award" was presented to Florence Lister for her exceptional contributions to the study of ceramics and especially her research on Spanish majolica pottery in both the Old and New Worlds with her late husband, Robert.

Additional information about the ceramic research presented at the SAA meeting and a list of the 71 papers will be found in forthcoming issues of *La Tinaja* and *The Old Potter's Almanac* (see below).

The 30th Anniversary Joint Conference of the Society for Historical Archaeology and the Society for Post-Medieval Archaeology was held in Williamsburg, VA from 6-10 April 1997. These societies, based in the US and in the UK respectively, co-sponsored the first of two joint conferences entitled "Archaeology of the British 1600-1800: Views from Two Worlds." The initial conference was chaired by Norm Barka (College of William and Mary) and the program

committee was chaired by Marley R. Brown III (Colonial Williamsburg, Department of Archaeological Research). Twenty three papers (11 by North Americans and 12 by British guests) were presented, with four focused on ceramic materials: John Allen (Exeter Museum), "Makers, Exporters, and Redistributors: The Role of the British West Country Ports in the 17th C. Ceramics Trade"; David Gaimster (British Museum) and David Barker (Stoke-on-Trent Museum), "The Ceramic Revolution, 1450-1650 and 1650-1850"; David Higgins (Liverpool University), "Little Tubes of Mighty Power" [smoking pipes]; and Stanley South (U. of South Carolina, IAA), "Excavation of the Pottery of John Bartlam, The First Creamware Potter in America." The second SPMA/SHA meeting will be held 3-7 November 1997 in London.

Newsletters

La Tinaja: A Newsletter of Archaeological Ceramics, a quarterly (Volume 10 = 1997), costs \$10 per year (\$15 for foreign subscriptions) - checks only - and is available from its editor, James E. Corbin, Box 13047 SFA Station, Stephen F. Austin University, Nacogdoches, TX 75962-3047. For information, e-mail: f_corbinje@titan.sfasu.edu

The Old Potter's Almanack: Joint Newsletter of the Prehistoric Ceramics Research Group and the Ceramic Petrology Group, has three issues per annum (Volume 5 = 1997) for £5.00. Subscription information may be obtained through the editor, Andrew Middleton, British Museum, Department of Scientific Research, Great Russell Street, London WC1B 3DG; telephone: 0171 636 1555, fax 0171 323 8276.

ACRO Update: Quarterly Newsletter of the Asian Ceramic Research Organization, edited by Chuimei Ho, is available from the Anthropology Department, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605. Subscriptions are \$15 per annum. Information is available via telephone, 312-922-9410 (ext. 308), or fax at 312-427-7269.

Three Forthcoming Ceramic Meetings Conflict

The annual Meeting of the American Anthropological Association is scheduled for 19-23 November 1997 in Washington, DC. The Ceramic Interest Research Group (a loose organization of archaeologists, ethnographers, art historians, potters, and physical scientists), organized in 1985 at the suggestion of Fred Matson (Penn State), has submitted its 11th annual Ceramic Ecology Symposium, "Ceramic Ecology '97: Recent Research on Ceramics" which includes ten papers. The co-organizers are Louana M. Lackey (Maryland Institute, College of Art) and Charles C. Kolb.

The British Museum in London is the sponsor of an exhibition and a conference entitled "Ceramic Technology and Production -- Until the Industrial Revolution" to be held 20-22 November 1997 at the museum. Additional information is available from Andrew Middleton or Ian Freestone, British Museum (see above for address, phone and fax).

The American School of Oriental Research annual meeting is scheduled in Napa Valley, CA from 15-21 November 1997.

Among the symposia already scheduled are Gloria London's (U. of Washington) session on ceramic ethnoarchaeology, "Pottery Analysis and Interpretation." Information may be obtained from: Gloria London, 7701 Crest Drive, NE; Seattle, WA 98115; 206-522-6426; e-mail: london@u.washington.edu

Publications

Mocha, Banded, Cat's Eye, and Other Factory-made Slipware by Lynne Sussman; 102 pp., 94 black-and-white figures, color cover illustration, 3 tables, 3 appendices, and references. Boston: Council for Northeastern Archaeology, Studies in Northeastern Historical Archaeology Number 1, 1997. This volume documents factory-made, mass-produced slipwares made by British, French, and North American potters from the late 18th to the 20th century. The volume's contents include an analysis of 22 types of decoration, historical information on the ware from commercial records and marked vessels, and a reconstruction of the chronology of decorations and forms based upon archaeological data. Copies may be ordered by check or money order payable to "Journal of Northeast Historical Archaeology," \$20.00 (US) per copy plus \$1.75 per volume postage and handling, \$0.25 for each additional volume. Send orders and remittance to: CNEHA, c/o Mary Beaudry, Department of Archaeology, Boston University, 675 Commonwealth Avenue, Boston, MA 02215; or correspond via e-mail: nha@bu.edu

The Cultural Resources Group, Louis Berger & Associates, Inc. has published *Analytical Coding System for Historic Period Artifacts*, prepared in June 1996 by Sharla C. Azizi, Diane Dallal, Mallory A. Gordon, Meta F. Janowitz, Nadia N. S. Maczai, and Marie-Lorraine Pipes. Chapter II concerns ceramics (pp. 5-62), Chapter III deals with glass (pp. 63-113), and Chapter IV considers pipes (pp. 115-137). The volume sells for \$20.00 plus \$2.75 each shipping and handling. It may be ordered by check or money order made payable to "Louis Berger & Associates, Inc." Mail to: Louis Berger & Associates, Attention: Sharla Azizi, 100 Halsted Street, East Orange, NJ 07019; 201-678-1960, fax 201-678-3427.

The British Museum Press, 46 Bloomsbury Street, London WC1 3QQ (tel 0171-323-1234, fax 0171-4367315) has announced two forthcoming publications. These may be ordered directly from the press by cheque or credit card (Access, American Express, Diners Club, Eurocard, Visa). *Pottery in the Making: World Ceramic Traditions*, edited by Ian Freestone and David Gaimster (ISBN 0 7141 1782X). Freestone is head of ceramics in the Department of Scientific Research, British Museum; Gaimster is a curator in the Department of Medieval and Later Antiquities, British Museum. The projected 240-page volume, scheduled for publication on 7 July 1997, will have 32 chapters prepared by 25 authors, and is supplemented by maps, a glossary, bibliography, concordance, an index, and 50 color and 200 black-and-white illustrations. The focus is upon raw materials and production techniques, and draws upon the vast ceramic collections of the British Museum to examine more than thirty

pottery traditions from prehistoric Japan to contemporary Africa and Indian Subcontinent and covers ca. 12,000 years. This handbook will cost £18.99 (plus 2.50 postage and packing), and 15% of order value for Overseas Surface Mail (airmail rates available upon request).

The second British Museum Press volume, *German Stoneware 1200-1900*, written by David Gaimster, is scheduled for publication in late October 1997 (ISBN 0 7141 0571 6). This 448-page book is a comprehensive review of collectible pottery including stoneware, based upon collections from the British Museum, Victoria and Albert Museum, and Museum of London. It has seven chapters, seven appendices, an index, and 40 color and 425 black-and-white illustrations. Among the appendices are: I: Scientific Study of German Stoneware: Provenance Studies, and II: Scientific Study of German Stoneware: Glazes. The volume will sell for £45 (plus 3.50 for postage and packing), and 15% of order value for Overseas Surface Mail (airmail rates available upon request). *The Archaeology of Martin's Hundred*, Vol. 1: Interpretive Studies, Vol. 2: The Artifact Catalog (together 700 pp., 164 illustrations, 95 black-and-white photos), by Ivor Noel Hume and Audrey Noel Hume, is scheduled for publication by the Colonial Williamsburg Foundation in early 1998. The anticipated cost of the two-volume set is \$95.00. For further information, contact: Director of Publications, Colonial Williamsburg Foundation, P.O. Box 1776, Williamsburg, VA 23187-1776.

"Ceramic Studies in Archaeology: The Interfaces of Anthropology and Materials Science" is the title of a bibliographic essay written by Charles C. Kolb that appeared in the December 1996 issue of *CHOICE: Current Reviews for Academic Libraries* 34(4):571-583. The essay emphasizes nearly 200 books and monographs published during the past decade and includes the following subheadings: Research on Ancient Ceramics, General Works and Principal Texts, Science and Archaeology, Laboratory Method and Interpretation, Petrographic and Physicochemical Analyses, Vessel Contents and Residue Analysis, Ceramic Ecology, Ceramic Ethnoarchaeology, Symposia, and Geographic Overviews: The Old World and The New World.

Background: Associate Editor for Archaeological Ceramics

Charlie Kolb is an administrator in the Division of Preservation and Access at the National Endowment for the Humanities, and has studied the physical and cultural properties of ceramic materials for over 35 years. Since 1962 he has conducted long-term archaeological field work in central Mexico, northern Afghanistan, and the Lake Erie Basin, and has done additional field and laboratory work on ceramic materials in Uganda, Peru, and Guatemala. At NEH he is responsible for grant applications that provide for the preservation of and intellectual access to library, archival, and material culture collections (in particular, microfilm, audio and videotape, moving images, photographs, negatives, digitization, storage conditions, and environmental controls) and for research and demonstration projects.

Monte Verde, Chile

“the ultimate field trip” (Ann Gibbons, *Science* 275:1256)

Dena F. Dincauze, Department of Anthropology, University of Massachusetts-Amherst, Amherst, MA 01003-4805, USA

A new version of an old-fashioned site visit was arranged through the Dallas Natural History Museum, with support from the National Geographic Society, to examine the controversial Monte Verde sites in Chile early in January, 1997.

The participants received pre-publication page proofs of Vol. II of the Monte Verde site report, and were asked to read 815 pages before convening on January 4 in Tom D. Dillehay's laboratory at the University of Kentucky in Lexington. There, the travelers were shown some of the lithic artifacts by Michael Collins, who had analyzed them for the report. They also heard a discussion of the ethnobotanical study by Jack Rossen, and saw fibers and knots recovered at the site. The group went on by private and commercial jets to South America, joined en route by colleagues from Chile and Colombia. A visit to the Universidad Austral in Valdivia permitted examination of wooden artifacts and the famous footprint, and included geological information from Mario Pino. While at the University, the group enjoyed a dinner cruise on the river.

Weather limited the site visit to a single sunny day. The visitors explored stretches of Chinchihuapi Creek, its environs and the stratification near the sites. The Late Pleistocene-age site is essentially destroyed; we saw what was left at the edge. The deep site with radiocarbon dates >30,000 was not re-exposed in time to be examined during the visit.

The visitors at the site included archaeologists Gerardo Ardila of Colombia and Francisco Mena and Lautaro Nunez of Chile, Chilean geologist Mario Pino Quivira, North American archaeologists James Adovasio, Alex Barker, Tom D. Dillehay, Dena F. Dincauze, Donald K. Grayson, C. Vance Haynes, David J. Meltzer, and Dennis J. Stanford, and Rick Gore and Ken Garrett of the National Geographic Society.

Following the site visit the participants discussed the evidence presented in the report, the laboratories and the field, and reached a consensus that the younger area was an archaeological site showing extraordinary preservation and integrity at the time of its investigation. Particularly compelling was the demonstration of the living floor with areas clearly indicative of diverse human domestic activities. Furthermore, the participants found no reason to doubt the validity of the radiocarbon ages of analyzed organic materials in, below, and above the site, which are interpreted as showing the site to be about 12,500 years old. Subsequent excitement prevented immediate consideration of the implications for revised prehistory of the Americas.

Daniel Wolfman: 1939-1994

We sadly note the passing of Dan Wolfman on November 25, 1994, in Albuquerque, due to complications from a chronic heart condition.

Dan's B.S. in mathematics was followed by M.S. and Ph.D. degrees in anthropology. He was assistant professor of anthropology at the University of the Americas, Mexico City (1966-1968), staff member of the Arkansas Archeological Survey, professor of anthropology at Arkansas Technical University and at the University of Arkansas (1973-1988), and staff member at the Office of Archaeological Studies, Museum of New Mexico, Santa Fe (1988-1994). Dan was a long-time member of the *SAS*, and a consular of the Society from 1982 until 1993. More details on Dan's life and career, and a bibliography of his publications, can be found in Schaafsma and Schaafsma (1996).

Dan's career was an interesting case study in the doing of archaeometry and the training of archaeometrists. His early mathematical background helped infuse his work with quantitative thinking. Archaeomagnetism, where Dan made his greatest contributions, is a field where the few labs in North America are roughly split between archaeologists and geophysicists. Dan approached archaeomagnetism from the archaeological side. As an anthropology graduate student, he spent several years in the late 1960s and early 1970s with geophysicist Robert DuBois (University of Oklahoma) where he and anthropology undergraduate Jeff Eighmy were introduced to archaeomagnetic field and laboratory techniques. [Jeff got me interested in archaeomagnetic directions when he was finishing his doctorate in archaeology and I was beginning my Ph.D. work in geophysics at the University of Arizona.] Later, Dan helped get me started on my ongoing archaeomagnetic research in Israel by connecting me with Egon Lass, an archaeologist in Israel whom Dan taught how to collect archaeomagnetic samples at Modoc Rock Shelter with University of Wisconsin-Milwaukee students.

Wolfman was an energetic proponent of the archaeomagnetic method for both geophysical and dating applications (see Wolfman 1984; articles in Eighmy and Sternberg 1980). He carried out fieldwork in Mexico, Central America, the American Southeast, the American Southwest, South America and West Africa. Dan had an encyclopedic knowledge of archaeomagnetism, having visited many labs around the world, and obviously having spent much time locating some of those arcane bibliographic references on paleomagnetism, archaeomagnetism, and the history of these disciplines. He struggled for many years to measure samples without a laboratory of his own, taking him to labs at the University of Pittsburgh and the University of California at Santa Barbara. Dan showed real boldness in giving up his position in Arkansas for a less certain status in new Mexico, where he was delighted to finally set up his own lab. I was unfortunately not able to visit Dan's lab until after he passed away, but I was impressed with what he had put together, with the large number of samples already measured, and with those

New Email List for Industrial Archaeology

To join, email the following message as the only text to

Mailbase@mailbase.ac.uk:

join ind-arch [first name] [last name]

still waiting to be processed by his long-time assistant, Jeff Cox.

On a more personal note, Dan and I had an ongoing dialogue about our mutual interest in archaeomagnetism. We often differed on how best to interpret archaeomagnetic data. One does not have to read too finely between the lines of our papers in Eighmy and Sternberg (1990) to see that. But we always enjoyed discussing our work together. I even began to second guess my differences with Dan when I read of other paleomagnetists who approached secular variation data from lava flows in a fashion similar to how Dan interpreted his archaeomagnetic data (Holcomb *et al.* 1986; Rolph *et al.* 1987). In the final analysis, as Dan and I often said, we 'agreed to disagree.'

I always pictured Dan as a friendly bear, full of life. When I called him on November 28, 1994, I was shocked to hear of his death. He was taken away too soon. We will miss him.

References

- Eighmy, J.L. and R.S. Sternberg (eds.). 1990. *Archaeomagnetic Dating*. Tucson: University of Arizona Press.
- Holcomb, R., D. Champion and M. McWilliams. 1986. Dating recent Hawaiian lava flows using paleomagnetic secular variation. *Geological Society of America Bulletin* 97: 829-839.
- Rolph, T.C., J. Shaw and J.E. Guest. 1987. Geomagnetic field variations as a dating tool: application to Sicilian lavas. *Journal of Archaeological Science* 14: 215-225.
- Schaafsma, P. and C. Schaafsma. 1996. Daniel Wolfman. *American Antiquity* 61: 291-294.
- Wolfman, D. 1984. Geomagnetic dating methods in archaeology. *Advances in Archaeological Method and Theory* 7: 363-458.

Rob Sternberg

Geophysical Exploration for Archaeology

This 729 page report is free to anyone who requests it. The report is divided into three sections. The first section is devoted to the archaeologist who would like to apply geophysical exploration to an archaeological site; it describes how to select an instrument and how one might specify a survey, and also give pointers about excavations after a survey. The second section of the report is for the individual who would like to start doing geophysical surveys; it has a tutorial on the procedures. The third section has very detailed information on geophysical exploration. This report is illustrated by a geophysical survey which was done at the US Civil War battlefield at Petersburg, Virginia, and shows how a buried cellar and refilled fortification ditches were mapped. The report is available only as a microfiche; you may obtain a copy by writing to: Bruce Bevan, Geosight, P.O. Box 135, Pitman, NJ 08071, USA.

Books Received

- Architecture and Meaning on the Athenian Acropolis*, by Robin Francis Rhodes. 1995. Cambridge University Press, New York. 218 pp., 92 ill., notes, glossary, index. \$60.00 (cloth); \$16.95 (paper).
- Architecture and Power in the Ancient Andes: The Archaeology of Public Buildings*, by Jerry D. Moore. 1996. Cambridge University Press, New York. xiii + 256 pp., 90 figures, 24 tables, references, index. \$59.95 (cloth).
- Before Farming: Hunter-Gatherer Society and Subsistence*, edited by Douglas V. Campana. 1995. The University Museum, University of Pennsylvania, Philadelphia. 116 pp., figures, tables.
- The Bronze Age of Southeast Asia*, by Charles Higham. 1996. Cambridge University Press, New York. xiv + 381 pp., 157 ill., 1 table, references, index. \$74.95 (cloth); \$27.95 (paper).
- The Cambridge Illustrated History of Archaeology*, edited by Paul G. Bahn. 1996. Cambridge University Press, New York. xiii + 386 pp., illustrations, references, index. \$39.95 (cloth).
- Case Studies in Environmental Archaeology*, edited by Elizabeth J. Reitz, Lee A. Newson, and Sylvia J. Scudder. Plenum Press, New York. xxi + 399 pp., figures, index. \$69.50 (cloth).
- Crossroads Alaska: Native Cultures of Alaska and Siberia*, edited by Valérie Chaussounet. 1996. Smithsonian Institution Press, Washington D.C. 112 pp., 2 maps, bibliography. \$19.95 (paper).
- Easter Island. Archaeology, Ecology, and Culture*, by Jo Anne Van Tilburg. 1995. Smithsonian Institution Press, Washington, D.C. 191 pp., bibliography, glossary, index. \$45.00 (cloth).
- An Ethnography of the Neolithic: Early Prehistoric Societies in Southern Scandinavia*, by Christopher Tilley. 1996. Cambridge University Press, New York. xix + 363 pp., 194 ill., 34 tables, references, index. \$79.95 (cloth).
- Europe in the Neolithic: The Creation of New Worlds*, by Alasdair Whittle. 1996. Cambridge University Press, New York. xv + 443 pp., 126 illustrations, bibliography, index. \$80.00 (cloth); \$34.95 (paper).
- Greater Medieval Houses of England and Wales: Volume 1: Northern England*, by Anthony Emery. Cambridge University Press, New York. xiv + 435 pp., 210 plates, 104 figures, 3 tables, index. \$125.00 (cloth).
- Humans at the End of the Ice Age: The Archaeology of the Pleistocene-Holocene Transition*, edited by Lawrence Guy Straus, Berit Valentin Eriksen, Jon M. Erlandson, and David R. Yesner. 1996. Plenum Press, New York. xiii + 378 pp., figures, tables, index.
- Hunters between East and West: The Paleolithic of Moravia*, by Jiří Svoboda, Vojen Loek, and Emanuel Vl ek. 1996. Plenum Press, New York. xiv + 307 pp., 2 appendices, references, index. \$45.00 (cloth).
- Living on the Boott: Historical Archaeology at the Boott Mills Boarding-houses, Lowell, Massachusetts*, by Stephen A. Mrozowski, Grace H. Ziesing, and Mary C. Beaudry. 1996. University of Massachusetts Press, Amherst. xv + 93 pp., 34 illustrations, sources, index. \$40.00 (cloth); \$12.95 (paper).
- Prehistoric Britain from the Air: A Study of Space, Time, and Society*, by Timothy Darvill. 1996. Cambridge University Press, New York. xvi + 283 pp., 146 ill., notes, references, index. \$59.95 (cloth).
- Settlement and Social Organisation: The Merovingian Region of Metz*, by Guy Halsall. 1995. Cambridge University Press, New York. xx + 307 pp., bibliography, index. \$69.95 (cloth).

Rock Images and Landscapes Digital Mapping and Recording Project

James I. Ebert, Ebert & Associates, 3700 Rio Grande Boulevard NW, Suite 3, Albuquerque, New Mexico 87107

Rock “art” or images¹, in the form of petroglyphs, pictographs, rock paintings, and a variety of symbols, drawings and representations made on rock faces by past peoples, constitute a fascinating component of the archaeological record. It could also be asserted that rock images represent one of the most underexploited parts of the archaeological record; only a small portion of the information about the human past that they can potentially provide has been tapped. There are a number of reasons that this is the case. The meaning and function of symbolic artifacts, of course, are probably among the most difficult of archaeological questions to approach; at a very specific level, form may be almost totally unconnected with symbolic meaning. The conception among some archaeologists that rock images are primarily symbolic, ceremonial, or “artistic” — with little other content — has probably channeled much effort away from its study into studies of more seemingly utilitarian artifacts with more “obvious” functions in society.

At a more methodological level, however, the reason that rock image studies have been relatively unchanged by the technical and analytical approaches that characterize much contemporary archaeology is fairly simple. Rock images are special sorts of artifacts, much less easily “collected” for study in the laboratory than stone implements or potsherds. Neither is it easy or straightforward to record rock images in the field. Recording even single instances of most sorts of rock images by drawing or sketching requires great skill and patience, and the difficulty or impossibility of representing all of its details by such methods frustrates rock image specialists. Photographing rock images is fraught with problems largely due to the subtlety of their markings, which only increases in time through environmentally- or culturally-induced deterioration. The best — and sometimes the *only* — way to see the subtle markings and tiny details that characterize most rock images is to actually *be there*, and to view the markings from different directions and distances, in varying lighting conditions, and from different positions.

“Hands on,” 3-dimensional digitizing, supplemented by electronic mapping techniques and photogrammetry, are the focus of research currently being conducted under partial funding from the National Science Foundation (Grant No. DMI-9560452), entitled “Rock Art Data Recording, Management and Analysis: An Integrated System Incorporating 3-Dimensional Digitizing, Geographic Information Systems, Photogrammetry and Other Digital Mapping and Imaging Technologies.”

This research is being undertaken by Ebert & Associates, Inc., an Albuquerque, New Mexico firm specializing in archaeological, anthropological, forensic and environmental applications of remote sensing, photogrammetry, image processing, and digital mapping technologies. Funded under a

Phase I Small Business Innovation Research (SBIR) grant, the research is directed toward determining the feasibility of innovative products or processes for an initial 6-month period, following the successful completion of which a proposal for a 2-year, Phase II period of product development is submitted.

Eileen Camilli and James Ebert are co-principal investigators, and Larry Loendorf and Julie Francis are research consultants to the Rock Images and Landscapes Digital Mapping and Recording Project.

Rock image studies are currently experiencing increased use of digital technologies, particularly digital imaging techniques. Ebert & Associates’ research will build upon such interests, incorporating a wide range of methods and techniques for the “total” recording of rock images and their significantly associated environments and landscapes. Such techniques will include

- 3-dimensional digitizing of rock art elements and their minute details, as well as geochemical sample locations, in the field;
- the collection of locational data for mapping rock images, rock faces, and details of the terrain a wide range of resolutions and scales using electronic distance measurement (EDM), global positioning systems (GPS), aerial and terrestrial photogrammetry, analog and digital photographic and imaging, and 3-dimensional digitizers;
- the integration of all scales of spatial data, as well as associated non-spatial data, in a single spatially-organized database utilizing 2-dimensional and 3-dimensional computer aided design (CAD) and geographic information systems (GIS) technologies; and
- software developed specifically to facilitate the integration of all stages of the “total system,” from in-field 3-dimensional digitizing and other map data collection, through integration and management of the database in CAD and GIS environments, to viewing, statistical analysis, and data output in multiple forms.

¹ The term “rock images” will be used in the course of this research to denote petroglyphs, pictographs, and all other “rock art” to help resolve terminological ambiguity as well as in recognition of the creators, users, and shareholders to whom the concept of these images as “art” is troublesome or incongruous.

Conference Report: Science & Archaeology

Rob Sternberg, President

A conference entitled “Science and Archaeology: Towards an Interdisciplinary Approach to Studying the Past” was held October 14-16, 1994 at Harvard University. The conference was organized by Robert H. Tykot (now at the University of South Florida; at right in photo) and Geoffrey D. Purcell (State University of New York, Albany; at left in photo). The conference was jointly sponsored by the Society for Archaeological Sciences and the Boston Society of the Archaeological Institute of America, and was supported by

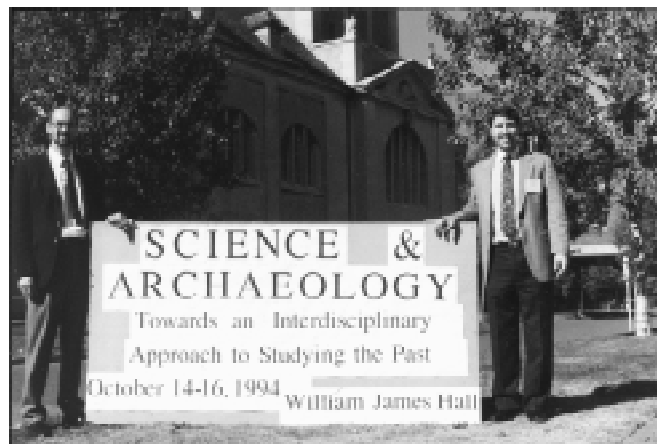
grants from the Samuel H. Kress Foundation and from the Archaeological Institute of America.

The purpose and central theme of this conference was to increase communication between and to integrate the research efforts of archaeologists, classicists, art historians, museum researchers, conservation scientists, and physical scientists, in their reconstruction of historic and prehistoric societies. To that end, the organizers invited scholars from several countries to specifically address the practical aspects of doing interdisciplinary research, including research design, data interpretation and synthesis, educational/training programs and curricula. Case studies of successful interdisciplinary projects illustrated the complementarity of scientific, art historical, and archaeological information and showed how a well-designed, collaborative effort can increase our understanding of the past.

Thus, this conference followed in the tradition of musings upon the relationship between archaeology and archaeometry/archaeological science. Some previous discussions of this issue include Olin (1982); Aitken (1982); Beck (1985); Jones (1988); Renfrew (1992); Dunnell (1993); Ehrenreich (1995); and McGovern (1995).

After pre-conference tours of the Archaeometry Laboratories and the Semitic Museum, Rob Tykot's opening remarks expressed his hope that the conference would emphasize how archaeometry is done, rather than an elaboration of techniques. Geoff Purcell pondered the mission of scientific archaeology. The article by Dunnell (1993) seemed to set the stage for the conference - Dunnell begins with "many, if not most, archaeologists regard archaeometry as a sometimes interesting, largely irrelevant, and definitely optional endeavor." Our goal should be, if not to make archaeometry always required, at least to make it relevant. But one should also remember, as Pollard reminded us to Aitken (1982), that archaeometry sometimes has as much to offer to the natural sciences as it does to archaeology. This is certainly true in my own field of archaeomagnetism, where we must first determine patterns of secular variation, with the implications of these patterns for the behavior of the geomagnetic dynamo, before we can utilize these patterns for determining conventional archaeomagnetic dates.

The 50 papers and posters presented at the conference succeeded often, if not always, in meeting the goals of the organizers. I personally appreciated the talks on the teaching of archaeometry. As the curriculum in my own liberal arts institution is under review, I hope it is revised in such a way that I can initiate a course in archaeological science, one of the relatively few endeavors where interdisciplinary links between the natural sciences, social sciences and humanities are natural, plentiful and mutually beneficial. The plenary addressed by Mark Pollard, from a Department of Archaeological Sciences (Bradford), and by James Wiseman, from a Department of Archaeology (Boston University), provided unusual perspectives on how these academic divisions might be integrated. The conference proceedings are being prepared for publication.



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Book Reviews

Calibration 1993 (*Radiocarbon* 35:1). M. Stuiver, A. Long, and R. Kra (eds.). University of Arizona, Tucson, 1993. 244 pp., 1 floppy disk in jacket inside back cover. \$105.00 institutional, \$73.50 individual, and \$36.75 student rate.

Reviewed by Peter I. Kuniholm, Department of the History of Art and Archaeology, Cornell University, Ithaca, NY 14853-3201

The 1993 Calibration Issue of *Radiocarbon* is the latest and most up-to-date international team effort to cope with the idiosyncracies of the radiocarbon time-scale. Full discussion of the 15 papers in the volume is beyond the space allotted for this review. Of greatest importance to the community of producers and users of radiocarbon dates are the following:

- (1) Extension of the oak tree-ring calibration to about 8000 BC. Minor corrections and refinements are made to the 1986 calibration curve. This is a major boon to Classical and Near Eastern archaeologists, since the Neolithic in the Eastern Mediterranean can now be calibrated. Until now we had to stop calibrating halfway back through the Bronze Age. Importantly, the interlaboratory collaboration and cross-checking continues, so that this 1993 calibration curve is really an international group effort by the best radiocarbon laboratories.
 - (2) The calibration of an almost 1,600 year Scots pine tree-ring sequence covering the period from ca. 9800 cal. BP to 11,400 cal. BP. Bernd Becker, shortly before his death, thought he could at last demonstrate where the pine and oak curves overlapped, thereby giving us a complete radiocarbon calibration from the last glaciation to the present. Thus, we have:
 - A. An absolute chronology from 7938 BC to the present (European oak). This is the most secure part of the calibration, and in this volume half a dozen laboratories have made refinements along various parts of this curve;
 - B. A floating 1784 year chronology from 9439 BC to 7655 BC (Scots pine) based on a tentative fit with the oak. This "fit" has (as of year-end 1995) been shown to be incorrect, and a small modification (no more than several decades) will be announced shortly. This, however, does not affect the vast majority of radiocarbon users.
 - C. Thus we have a single tree-ring calibrated chronology from about 11,400 cal. BP to the present (both pine and oak), the pine from the period when Europe was still too cold for oaks to grow, the oak phasing in and the pine phasing out as the continent grew warmer.
 - (3) In addition to the tree-ring calibrated curve the 1993 volume presents an extension from 11,400 BP to 21,950 BP based on marine corals. This calibration is necessarily less precise than the one based on the tree-rings.
 - (4) The age calibration program covering almost 22,000 years (CALIB 3.0, from the Quaternary Isotope Laboratory at the University of Washington) in the floppy disk in the jacket on the back for IBM-compatibles has undergone two revisions since the time of publication. CALIB 3.0.3 should now be used. A Macintosh version is also available.
- Calibration 1993*, although not the final word on the subject, should be in every archaeological, geological, and physical sciences library, among others, and in the hands of every graduate student interested in archaeometry. It is, for the present, the best and most precise synthesis that we have on the subject. New refinements in technique, a better understanding of regional variations in radiocarbon, and sophistication in wiggle-matching allowed by such programs as OxCal 2.18 will no doubt result in yet another Calibration Volume, but until that happens, this is the primary source.

Note: the SAS Web Page has a C14 dating section which includes links to sites where both Calib and OxCal may be downloaded.

Materials Issues in Art and Archaeology III. Pamela B. Vandiver, James R. Druzik, George Segan Wheeler, & Ian C. Freestone (eds.). Materials Research Society Symposium Proceedings Vol. 267, Pittsburgh, Pennsylvania, 1992. liii + 1101 pp. \$62.00 (cloth).

Reviewed by A. Mark Pollard, Department of Archaeological Sciences, University of Bradford, BD7 1DP England, UK

Another Monster! This particular volume is the third in the series *Materials Issues in Art and Archaeology*, and represents the proceedings of the conference held in San Francisco in 1992. The fourth volume, consisting of papers presented at the 1994 Cancun conference, appeared in 1995, and the fifth, based on the fall 1996 Boston meeting, is due out shortly. In terms of size, it is another monster - 1100 pages, 83 papers plus 7 introductory comments (not 81 papers, as claimed by Vandiver in her introduction!), split between five parts with a total of 13 different sections.

The parent Symposium is hosted by the Materials Research Society of the USA, and this inevitably focuses the papers strongly towards aspects of archaeological materials science. The purpose of the Symposium (and hence, presumably, of the volume) is clearly stated in the preface: 'reporting and interpreting new developments in technical studies of material culture and in the conservation science required to preserve that heritage'. The goals are specifically identified as: 'to present work on (1) ancient materials, (2) the technologies of selection, production and usage by which they are transformed into the objects and artifacts we find today, (3) the science underlying their deterioration, preservation and conservation, and hopefully, although this goal is achieved infrequently, (4) socio-cultural interpretation based on an empirical methodology of observation and measurement'. In a memorable review of the previous volume in this series (*Why archaeologists don't care about archaeometry, Archeomaterials* 7 (1993): 161-165), Dunnell castigated archaeometry as 'a sometimes interesting, largely irrelevant, and definitely optional endeavour'. The current volume simultaneously illustrates and refutes that stinging statement. Much of the archaeological materials science would appear to be, at least on the strength of the evidence presented here, optional (but sometimes interesting!) as far as archaeological interpretation goes. The conservation science - the fundamental science of deterioration and preservation - is definitely not an optional endeavour, and sometimes involves some heavyweight science.

The structure of the volume is as follows:

Introductory section (7 contributions)

Part I: Cultural Heritage in Conflict

A. Historical Perspectives (4 papers)

B. Contemporary Perspectives (6 papers)

Part II: Examination, Technical Analyses and Discovery

A. The Geological, Geochemical and Biogeochemical Context (2 papers)

B. Characterization of Composition and Structure of Art Objects and Archaeological Artifacts (11 papers)

- C. Properties of Materials Used by the Artist, Artisan and Conservator (9 papers)
- Part III: Ancient Technology, Craft and the Role of Technology in Material Culture
- A. Craft Reconstruction from Evidence of Workshops, Industrial Debris and Artifacts
1. Production events, tools and techniques (3 papers)
 2. Production sites and process reconstruction (10 papers)
- B. Pattern of Production, Raw Material Constraints and Style of Technology (3 papers)
- C. Technical Analysis, Ethnography and the Written Record (3 papers)
- D. The Use of Artifacts and Their Reuse (3 papers)
- Part IV: Conservation Science and Preservation
- A. Identification and Physical Chemistry of Post-Depositional Processes (6 papers)
- B. Deterioration, Treatment and Structure in Architectural and Building Materials (13 papers)
- C. Glass Corrosion and Preservation (3 papers)
- D. Corrosion of Metals and Corrosion Protection (4 papers)
- Part V: Experiments in Artifact Study and Education (2 papers)

It is difficult to classify and analyse these contents against the stated aims of the volume. The first section (Cultural Heritage in Conflict) comes as something of a surprise when opening the book - 10 papers (147 pages), essentially devoted to the problems of Cultural Resource Management in conflict situations, ranging from a discussion of the measures taken to protect objects in the British Museum during both World Wars through to the destruction wrought by the Gulf War and the conflict in the former Yugoslavia. Although difficult to reconcile with the scientific aims of the volume, this section provides a sobering perspective on the essential fragility of cultural remains, but also on their symbolic importance in national identity, however contrived. It is hard to avoid the conclusion that potentially the most destructive agent in the natural environment is man (*sensu stricto*).

The bulk of the papers in the volume fall into three main sections, largely covering the three goals of the analysis of ancient materials, understanding ancient technologies, and conservation science. To me, the potentially fascinating section entitled 'Geological, Geochemical and Biogeochemical Context' is extremely disappointing - two papers, one concluding that cation-ratios may not be a reliable method of dating rock varnishes (why am I not surprised by this?), and another which unintelligibly recommends the use of a whole host of geoanalytical techniques (followed by multivariate analysis, to make things worse!) to understand the nature of 'dark earth' deposits. The authors conclude that 'Dark Earth was deliberately deposited by man, presumably after the urban centres had become depopulated' - what nonsense! Either apply a little common sense, or check out the extensive literature on the subject. Neither support such a ludicrous suggestion. If this is an example of the benefits of using 'holistic geoarchaeology', count me out.

Rather more soundly based, although of varying levels of durability and import, is the section on materials characterization (11 papers). The objects studied include the usual suspects - Chinese bronzes, ironworking slags, etc., but

also some more unusual applications such as metal threads from Italian textiles and vegetable resins used to color Central African ceramics. As is usual with such a mixture of materials, one has to conclude that if you are interested, then they are interesting. If not, then rarely do they contain enough contextual information to enable the reader to evaluate the significance of the work. An exception is the paper by Hexter and Hopwood on Kongo ceramics, which does contain enough detail to sustain the jaded palate. I would classify this as 'appropriate science', in contrast to the techno-overload illustrated by the paper on iron slag, which left me with a simple question - why was the work done? The final section in this part on the properties of materials used by conservators (9 papers) is sustained largely by the excellent work of Mecklenburg and his colleagues at CAL. This is serious stuff, and the four papers from this group are a significant contribution to the study of artists' materials.

Part III (Ancient Technology) is approached with something of a sense of foreboding. Although grouped into four sections, there is little coherence between papers. The majority of the papers under the heading 'Craft Reconstruction' are devoted to pottery production - Neolithic Chinese, Korean Celadon, Roman fineware, to name but a few. Metals are represented by the inevitable (and still controversial) re-assertion of Goltepe as a tin processing site, and a brief interpretation of the metalworking activity at the important Iron Age/Roman site of Hengistbury Head, Dorset, UK. There are some good papers here - particularly that of van As and Jacobs on the technology of second millennium BC pottery from Mesopotamia, and Henrickson on use wear on potter's tools, but there are inevitably also some of more questionable value. Organic materials are represented by a single but highly detailed study of archaeological bitumens from the Near East, which deserves to be more widely read than may be the case.

The final two sections of the part, relating to the technical interpretation of the written record (4 papers) and the use of artifacts (3 papers), go some way towards meeting the criticism of archaeological irrelevance made by Dunnell and others, and also to achieving the elusive 'Fourth Goal' listed above. The two studies of Theophilus, one on glass and the other on bell-casting, are both excellent, and conclude that he actually knew what he was talking about, and that his descriptions are still of great value, 900 years later. I bet none of our writings will be read in 900 years time! The contribution of Impey, on the use of Oriental porcelain in Europe, is a masterly review, despite being almost totally ruined by the atrocious quality of the illustrations. The contribution on the XRF study of Medieval Limoge enamels is the sole contributor to the 'reuse' section in 'The Use of Artifacts and their Reuse', although the evidence for reuse of Roman tesserae rests on the fact that the enamels do not have a potash-based composition (unlike contemporary window glass), and that Theophilus recommended such reuse! In the light of the above, it would seem that the literary evidence is more compelling than the scientific data, on current knowledge, but a good contribution, nevertheless.

The final substantial part of the volume is devoted to conservation science and preservation. It includes studies of the degradation of pigments, bone collagen, a good paper by

Greenlee and Dunnell (!) on the *post mortem* inorganic staining of bone, and a whole host of papers on the deterioration of stone. Two sections are outstanding - that on glass (which contains a gem of a paper drawing parallels between glass corrosion and the lamentably ignored subject of the deterioration of ceramics), and that on metals, with two high-powered theoretical presentations by McNeil and Mohr - again, serious stuff. Taken together (and they are inevitably of varying quality) the papers in this section represent a substantial contribution to conservation science, which is perhaps in danger of being overlooked by being buried in such a volume.

So what does it amount to? A monster, in several senses. I applaud the intentions of the parent conference - there is a coherence and a sense of purpose which is often lacking in other conferences, and the juxtaposition of materials science and conservation science works well. As for the volume, despite the fact that it represents good value for money (at least in terms of pages per dollar!), it is too big to be really practicable. It contains a handful of papers of enduring quality, but, like so many conferences, much is interim statement stuff at best. Reviews of previous volumes in this series have questioned the size of the volume, and I can only add weight to that. I think it actually detracts from the value of some of the papers to present them in such a way. Why not produce two volumes - one on technological studies of archaeological materials, and one on conservation science? There is, of course, the danger that if Dunnell was right no-one would be interested in the ancient technology stuff - why not put it to the test? (I have little doubt that the conservation science would stand on its own).

One last word. The production is poor in some cases - papers were clearly presented camera ready, and this results in a series of **type faces** and font sizes, including some as small as this, as well as variations in format and referencing style. Taken together with the size, it doesn't make for an easy read!

Interpreting Space: GIS and Archaeology. Kathleen M.S. Allen, Stanton W. Green, and Ezra B. Zubrow (eds.). Taylor & Francis, Bristol, Pennsylvania, 1990. xiv + 398 pp., \$105.00 (cloth).

Reviewed by James I. Ebert, Ebert & Associates, 3700 Rio Grande Boulevard NW, Suite 3, Albuquerque, NM 87107 USA

In 1990, when this volume was published, it was appropriately seen as a harbinger of the application of what was then a new (and to some extent not very accessible) technology to archaeological research and cultural resource management. In the years since then, archaeologists' familiarity with the concept and capabilities of geographic information systems has grown to the point that few within the discipline would regard GIS as some sort of novel technology being "pushed" by a fringe of enthusiasts who would, a couple of decades ago, have been wearing slide rules on their belts.

Geographic information systems and some directly related aspects of digital technology have changed radically since 1990. GIS software itself has evolved in that time to the point that highly sophisticated and versatile spatially organized database management systems are not only practical but in widespread use around the world for such mundane purposes as keeping track of power lines, sewers, and roads, routing fire fighters and newsboys, and determining the best locations for fast food restaurants. While there were only a few GIS software packages available - all fairly "high end" - in 1990, now there are literally hundreds with varying levels of capability and cost. Perhaps the most stunning transformation in those six years has been in the availability and performance of computers and peripheral devices; an effective GIS platform of the sort appropriate to archaeological applications (software, a computer, and peripherals) which would have cost in the neighborhood of \$50-200,000 to assemble when *Interpreting Space* was published might require an outlay of \$10-25,000, or perhaps even less, today.

Yet while the GIS world has changed so fundamentally, how successful have archaeologists been at integrating this technology into either the theoretical, or the most practical, aspects of our discipline? Perhaps, as yet, not very successful. There are several fundamental reasons that this is the case, and revisiting and reflecting upon *Interpreting Space* and the insights it presented, and still presents, may be an even more helpful exercise today than it was in 1990. Numerous journal articles and at least one edited volume focusing on GIS in archaeology have been published since, and another volume, based on one of Southern Illinois University's Visiting Scholar Symposia, is scheduled to appear this year. Yet *Interpreting Space* still contains the most insightful and complete discussion of GIS and its archaeological implications - as distinct from applications - available today.

Geographic information systems are defined in most texts or articles as a combination of hardware and software directed toward spatially organized database management and use. The introductory section of *Interpreting Space* emphasizes another sort of definition: GIS, to its authors, represents a new way of looking at and thinking about archaeological data and what it means. One of archaeology's most fundamental problems is rooted in our inability to comprehend and synthesize data at any but a small range of spatial scales, as is pointed out by Stanton Green in this volume's introduction. Archaeologists can think about intrasite patterning, or regional patterning, but not both at the same time. As many archaeologists have realized for a long time, uniting site-focused and regional studies into what is often referred to as "landscape archaeology" is probably the next necessary step in the evolution of the science. Unfortunately, we have yet to realize much progress in the direction of landscape archaeology beyond voicing of aspirations. Finally making landscape approaches possible, Green feels, is the largest methodological contribution GIS can make to archaeology.

Geographer Duane Marble describes, in the next chapter in the volume's introductory section, GIS's greatest potential theoretical contribution to archaeological science, something that has been discussed, and sought after, but never really

effected for about 30 years. In archaeology, reasoning has always proceeded from data to theory, again probably because of our inability to perceive and think about distributions on spatial scales ranging from centimeters through thousands of kilometers at the same time. GIS, Marble suggests, should allow archaeologists to address theoretical questions to what will hopefully be vast, high resolution spatial databases and to finally approach the validation of spatially-based theory.

Chapters in the volume's introductory section following those by Green and Marble are also directed toward wider implications of GIS in archaeology. Stephen Savage introduces such questions as how raster vs. vector GIS might produce different sorts of archaeological interpretations of the same databases, and how GIS might be applied to predictive modeling and landscape approaches. Trevor Harris and Gary Lock outline the "diffusion" of GIS among archaeologists in the United Kingdom. Ways in which GIS databases might affect freedom of information in archaeology are discussed by Linda Stine and Roy Stine.

The second section of *Interpreting Space*, entitled "Theory and Methodology," begins with a chapter by Ezra Zubrow who, in his usual (and always enjoyable) fashion, manages to surpass any other author in the volume in "theoretical-ness." Tools - i.e. methods - and theory interact in complex ways, Zubrow notes, and data managed in one way may have different theoretical implications than if it were managed in another. In a raster GIS, for instance, "...meaning is independent of boundaries," (p. 72), while in a vector GIS, boundaries in fact embody meaning. This chapter is the best illustration I can think of that GIS might change the very ways archaeologists think about archaeology, and everything else. Zubrow's chapter is followed by a valuable and comprehensive discussion of the basis of landscapes as a unifying concept in regional analysis by Carole Crumley and William Marquardt, followed by progressively more "methodological" subjects such as considerations of archaeological/GIS database design (Stine and Lanter), "predictive modeling" as an archaeological method (Robert Warren), and the diverse effects of various algorithms for producing contours from digital elevations models, and vice-versa (Kenneth Kvamme).

Beginning on a theoretical note, and grading into more methodological concerns, the first and second sections of *Interpreting Space* constitute an approach to GIS and archaeology that is refreshingly atypical of most archaeological reasoning, which usually starts off the other way around. The authors suggest that GIS might assist archaeologists in the practical aspects of making theory drive method. Whether or not this will be the case, it has not been yet. GIS will not wreak any sort of widespread change in archaeology unless archaeologists use it to do things they weren't able to do before - unless they actualize the sort of changes in thinking that Zubrow and the other authors suggest GIS can bring. And by and large they have not. Most GIS applications in archaeology (most of those in later sections of this volume included) could have been accomplished by overlaying maps on a light table.

To what extent our failure to think creatively, to figure out new things to do with GIS rather than just streamlined old ones, has to do with digital technology itself is a topic that

could probably be hotly debated. My thought is that digital technology may have much to do with mindblocks in the profession. It could be argued that, this volume notwithstanding, the last time there was much of an emphasis on the subject of archaeological theory (excepting off-the-wall structuralism) in our literature was at just about the time personal computers were becoming widely available. Since then, if my own experience is to be credited, we all probably have been spending a lot of our time trying to make computers and software work (i.e. on technology or "method," if we should be so lucky to apply that technology in any way to data analysis), rather than thinking about theory. The literature certainly seems to reflect this, and someone should do a quantitative study.

GIS software itself may be a reflexive culprit in retarding applications of GIS to archaeology, as most archaeologists who have tried to use it can attest. The GIS software packages that do the most are essentially the oldest ones, development of which began in the 1970's or even before. They were developed accretionally, and are so complicated that one must essentially be a "specialist" to use them efficiently. It's not that they are really difficult to use, no more difficult than using a word processing program very efficiently - but how many of us can do that? Simpler, lower-end GIS software is more straightforward to use but has limitations in terms of capabilities, resolution, and the like. In city governments or at power companies, an infrastructure of specialists in things like GIS can be created, but most archaeologists don't have the luxury of having employees to do GIS, nor to maintain high-end computer systems to use the more versatile software. This is a situation that is unlikely to change in the near future.

Part III of *Interpreting Space*, "Data sources, hardware and software," suffers in some respects from the passage of time, and in other respects still accurately reflects today's reality. Zubrow and Green, and Stine and Decker, outline sources of actual, available non-archaeological data (digital elevation and other map data, and remote sensing-derived data), and Farley, Limp and Lockhart set forth ways of integrating such data within a GIS framework.

These last authors were among the few archaeologists who, at the time their chapter was written, had had real experience in trying to put together massive and complex archaeological and supportive databases. Their brief chapter only begins to illustrate that, in fact, the problems associated with converting existing information, archaeological as well as non-archaeological, to digital form and organizing it in a unified database is probably the second major reason that archaeologists have yet to realize the potential of GIS. When *Interpreting Space* was written, what nearly all archaeologists meant when they said they wanted to put together a geographic information system was that they wanted to buy a computer and some software. As many archaeologists today - particularly the cultural resource management segment of our profession - are painfully aware, the central and by far the most costly component of a GIS is the digital database or databases managed by the hardware and software.

Farley, Limp and Lockhart's chapter is daunting as it stands to those who would "have a GIS," and if they were to re-write

it today, given their subsequent experience in putting together a GIS to support the Arkansas cultural resources database, it might instead be terrifying to just about all of us.

Ebert & Associates, Inc., our company here in Albuquerque, New Mexico, recently concluded a year long, in-depth study of what it would take to convert state cultural resource management databases into geographic information systems format. Our study was partially supported by the National Science Foundation (Award No. III-9360278) under their Small Business Innovation Research (SBIR) program. The SBIR grants program is intended to fund small private-sector businesses to develop innovative, marketable technologies. The SBIR program consists of a Phase I feasibility study which is hopefully followed by development of the technology *per se*. In our case, NSF chose not to fund our second phase, contending that there "is not a market for GIS conversion of state CRM databases to GIS format." In some pragmatic respects, at the present, they may be correct in this contention. Our findings indicate that in some states that have large numbers of cultural resource sites, which have been discovered in the course of many cultural resource surveys, the costs of converting past site data to GIS format will be considerable, on the order of millions of dollars. The state CRM offices of course just do not have the resources to do this themselves, except in a few notable cases, and certainly do not have the funding in place (although possibly it could be found) to contract out such conversion efforts to the private sector. Yet state CRM data are essentially our only source of site information at high resolution at a regional scope. Particularly onerous is digesting data from the site forms and hard-copy maps that are the basis of state databases into digital formats. My current take is that this can probably never be done to any workable extent, and that perhaps what we should aim for is to be sure that future site data are directly recorded in digitally-compatible (and analytically meaningful) format. As far as I have been able to tell, no state has plans in place to do this, to change their site data recording methods so that these will be automatically part of a GIS. Some states are entering some data in GIS form, notably Arkansas and Wisconsin, but not much of the data that actually resides on site forms. In order to be able to use these data in digital, GIS-based analyses, however, this will have to be done.

Part IV of *Interpreting Space*, "Applications," consists of case studies, based on small databases which do not begin to require or exploit the capabilities of GIS methods as enthusiastically set forth by the authors in previous sections. The papers in this section are those that we will probably want to think of as illustrations of what archaeologists did "way back when" GIS was just beginning to be used in archaeology. There are three notable exceptions, however. In two separate but closely related papers, Zubrow and Kathleen M.S. Adams use GIS methods to trace historic European expansion along waterways into the state of New York, defining trade networks and centers and tracing networks and influences. Scott Madry and Carole Crumley summarize their work of a decade or more in Burgundy, France, which has constituted a pioneering effort in using remote sensing, GIS and related technologies in support of their research into Medieval use of the landscape

there. Crumley and Madry are two of the pivotal figures in combining satellite and aerial remote sensor data, GIS technologies, and on-the-ground reconnaissance into a coordinated whole in studying the land use and prehistory of a region in recent years.

In their conclusion to *Interpreting Space*, Allen, Green and Zubrow imagine some themes to appear in the near future of GIS in archaeology that are completely consistent with reality as we enter 1996. They predicted that GIS might be taken up by some archaeologists who wanted to use technology as an end in itself, and certainly to some extent it has been. They imagined the convergence of raster and vector GIS systems, which is currently taking place. Another of what they refer to as "GIS fantasies" (p. 385) is the development of GIS by state and federal agencies to manage the vast regional site databases that currently lie in thousands of file cabinets and tens of thousands of paper maps at SHPO offices across the United States. Unfortunately, this may indeed remain a fantasy for a long time to come, and until it enters the realm of reality there will be little GIS-facilitated research use of what essentially are our only available high resolution regional-scale data.

Progress in Old World Palaeoethnobotany. Willem van Zeist, Krystyna Wasylkowska and Karl-Ernst Behre (eds.). A.A. Balkema, Rotterdam and Brookfield, VT, 1991. 350 pp. \$61.00 (cloth).

Man's Role in the Shaping of the Eastern Mediterranean Landscape. S. Bottema, G. Entjes-Nieborg and W. van Zeist (eds.). A.A. Balkema, Rotterdam and Brookfield, VT, 1990. 349 pp. \$63.00 (cloth).

Reviewed by Mark Nesbitt, Institute of Archaeology, University College London, London WC1H 0PY, UK

Human-environment interactions are, in this age of global warming and biodiversity crises, hot topics in archaeology. At the same time, this is a subject that lends itself to - indeed can only be effectively investigated by - interdisciplinary studies. The resulting literature, sometimes jargon-heavy, is published in a wide variety of languages and specialized journals. These two volumes are well edited, clearly written gateways to a wide range of data, ideas and bibliographic references.

Progress in Old World Palaeoethnobotany marks the 20th anniversary of the International Work Group for Palaeoethnobotany (IWGP), a European body whose main function is to hold a meeting every 3 years. Its subject coverage - plant remains (mainly seeds) from archaeological sites in Europe and the Near East - forms the basis of a series of review papers in this volume. Firstly, six papers survey thematic topics: identification methods, taphonomy, sampling, statistics, ecology and economy. These contain interesting material, but tend to be presentations of personal research projects (with a strong central-European bias) rather than overviews. Perhaps

the day is past when a single author can cover such a theme. With one exception, a clear overview of statistical techniques by Glynis Jones, these topics are more fully covered in Hastorf & Popper (1988). I was surprised that ethnoarchaeology - widely practiced and applied in areas such as northern Europe and the Near East - is not discussed.

The real core of the volume is the nine papers giving regional overviews of archaeobotanical data, ranging from the British Isles, continental Europe, the Near East to the former Soviet Union. Anyone who has tried to tackle questions of hunter-gatherer diet or agricultural change in any part of Eurasia will be aware of the nightmarish maze of conflicting chronologies and obscure citations surrounding archaeobotanical data. These reviews, with chronological expositions of sites and plant remains, illustrated by clear maps and tables and extensive, accurate, bibliographies, are an invaluable guide. Anyone interested in using archaeobotanical data will want to have this volume to hand.

Some of the papers do reflect a more traditional approach to archaeobotany, where plant remains are to some extent studied in isolation from cultural evidence. Lists of plants are given, with little explanation of *why* the observed changes are occurring. There are two outstanding exceptions: Naomi Miller's chapter on the Near East tackles a large area with formidable time depth, and successfully organizes the data with clear reference to major archaeological questions such as the origins of agriculture. Similarly, James Greig also discusses the wider archaeological background and implications of archaeobotanical data in his chapter on the British Isles.

Overall this is an outstandingly useful reference book, which stands as an excellent record of the explosion of archaeobotanical activity that has occurred since the beginnings of the IWGP in 1968. Its emphasis on data rather than explanation is in complete contrast to *Man's Role in the Shaping of the Eastern Mediterranean Landscape*. This volume is the result of a conference held at Groningen in 1989, with 28 papers using different types of evidence to address big questions regarding human-environment interactions. The emphasis is less on publishing detailed data and more on results and major methodological issues, which makes this a readable book, and a good introduction to current issues in the field.

The main underlying theme of most of the papers is the difficulty of disentangling the human impact on the landscape from that of climate. This is discussed with reference to episodes of soil erosion in Greece (van Andel & Zangger; Allen; Bruckner), Turkey (Roberts; Kayan), Yemen (Fedele) and the Levant (Goldberg & Bar-Yosef; Bruins; Raban). It is a particularly valuable aspect of this book that overlapping papers on the same geographical region are presented: the different attitudes of different authors to similar data is highly instructive. The message of these geoarchaeological papers is that cycles of deposition and erosion of soil do occur, and can to some extent be cross-correlated between different areas. However, the relationship between these cycles and human activity in the landscape is still problematic, not least as dating natural soils is still difficult.

There is also a wide range of attitudes to the benefits and drawbacks of human impact. One farmer's soil erosion could

well be a valley-dweller's soil deposition. At one end of the spectrum, Köhler-Rollefson and Rollefson take a gloomy view of Neolithic farmers' impact on the landscape of Jordan, at the other, Bruins describes successful runoff-farming systems in the Negev desert. In my view, human impact on the landscape, especially in later prehistory and later, is well demonstrated by this volume, but evidence for catastrophic environmental events in the past (whether human or climate induced) is still very scanty.

Botanical evidence for human impact is also well featured, with 11 papers that draw mainly on evidence from pollen cores. Here is welcome questioning of the quality of evidence for agriculture and forest-clearance in pollen cores, in a range of papers using Near Eastern evidence (Behre; Bottema & Woldring; Baruch; Roberts). Bottema and Woldring's paper applies conventional palynological indicators for cultivation to samples of modern pollen rainfall from known environments - an effective approach that could be more widely used. As with geoarchaeology, it is not just the significance but also the chronology of events that is questioned; pollen cores suffer from severe problems in dating. Overall it appears that the ideal for studies of human-environment impact - *independent* lines of evidence for climate, human settlement, and environmental change - is still lacking in most areas.

Although most of the research described in these volumes is based on one scientific technique, rather than a range, these papers are welcome examples of integration of scientific techniques within wider archaeological projects. This is a stimulating book that will be of interest to archaeologists working in other regions, as well as being an excellent introduction to work in the Aegean and Near East.

Reference

Hastorf, C.A. & V.S. Popper (eds.). 1988. *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*. Chicago University Press.

Science and the Past. Sheridan Bowman (ed.). British Museum Press, London, 1991. 192 pp. £16.95 (cloth).

Reviewed by Garman Harbottle, Chemistry Department, Brookhaven National Laboratory, Upton, NY 11973-5000

This interesting volume constitutes a worthwhile introduction for the lay reader to the application of the sciences as a tool for investigating the past but also in the services of the museum for other, rather more technical tasks. As is noted at the outset and even on the fly-leaf this book is firmly oriented toward the work and interests of the Department of Scientific Research at the British Museum, a laboratory headed by Sheridan Bowman. This decision on the part of the Editor is both a strength and a weakness...a strength because Bowman and her colleagues are writing about research in their specialties and a weakness because much had to be left out. For example, there is no mention of paleodiet, nor prospection study. Let

us, however, accept this limitation and see what pleasures the compilation of contributed articles offers.

Paul Craddock's essay, which opens the book, deals with the history of scientific work in support of historical research - Klapproth, Sir Humphrey Davy, Percy's *Metallurgy* - and then focuses on the British Museum's innovative idea of an attached research laboratory after World War I. Here again Craddock's review is most interesting in the areas closest to home, of course including Dr. Craddock's own contributions which have been of great importance to archaeometry generally. This chapter with its excellent bibliography provides a splendid introduction for the interested reader.

Andrew Middleton's elegant chapter on ceramics and their history vis-a-vis science is good for its flow from the basics of pottery and brick-making into the scientific and technical background against which our ages-long practical and artistic interests in this material are projected. He devotes one page, enough to whet but not satisfy the appetite, to brick and tile-making, which have been of such extraordinary importance to human progress. My own interests (with Allan Gilbert at Fordham University) suggest that much more research could be applied here with profitable results. It is significant that the Romans' proficiency with ceramic flue-tiles allowed them to put central heating into houses in Britain, an idea that had been largely forgotten when I arrived in England in 1951. Again, Middleton deals with the strengths of the British Museum: scanning electron micrography, the study of porcelain, moulds for bronze and other metallurgy. His concern with the technology of ceramics as revealed by research leaves to Michael Hughes, in a later chapter, questions of how to assign provenance to ceramics.

Ian Freestone's chapter on glass follows much the same pattern as Middleton's on ceramics. It is so well written and such a good introduction for the "science-minded layman" that one is astonished to see that he has used only 18 not-very-closely printed pages. His contribution illustrates the rule throughout this book, condensation, careful choice of examples and succinct bibliographies to pack maximum value into each chapter. Of particular interest is Freestone's treatment of the microanalysis of the "Portland Vase", a project with Mavis Bimson in 1983. Why on earth would anyone, even someone with a demented mind, smash something so beautiful? Freestone and Bimson's SEM study of the tiny fragments left over after reconstruction and repair of the Vase is treated in most interesting detail; the same is true of their investigation of the astonishing and unique Roman dichroic "Lycurgus Cup". Visits to the BM's Roman glass collection reinforced by the Roman Museum in Cologne and the great collection of Corning Glass in upstate New York can only leave one astonished at what the Romans accomplished without gas-oxygen torches and temperature-controlled furnaces.

Craddock's second essay, on metallurgy, is also well done and fairly comprehensive given the restricted space. It deals with Mining and Smelting in Antiquity, a field to which he has contributed much. One regrets that this chapter was finished too early to permit mention of A. Yener's remarkable discoveries of ancient tin mining in Anatolia, so crucial to the unfolding of the Bronze Age. He should, however, have

included in his bibliography *The Search for Ancient Tin*, the proceedings of a seminar at the Smithsonian in 1977 (eds. Franklin, Olin and Wertime), in which he himself participated.

Much of the fascination of visiting a museum like the BM, which memorializes the collecting habits of generations of Englishmen, lies in its collections of metal objects: the suits of armor, bronze from ancient China, jewelry, great Roman silver dishes, coins and sculpture. Chapter 5, by Cowell and La Niece, deals admirably with laboratory studies that have opened our eyes to the skills of ancient artisans, to their knowledge of alloys, casting, soldering... in short, all the expertise that developed in the absence of scientific research and are now revealed by it. The authors also explain the means of decorating and finishing metals, leading to the modern replication of ancient artisanship. Again, they draw on examples in the collections of the BM but the objects discussed are to be found in most major museums worldwide. Clearly this is an important area for the objects conservator who must constantly invoke these laboratory techniques to understand and combat the ravages of time.

Hughes' essay "Tracing to Source" draws on his skills and contributions to the field of provenance research; yet he includes cases where provenance testing does not work well, for example in metals, and explains why. Although he devotes most of his space to ceramics, he also mentions stone such as flint and the value of detailed petrographic investigation. He might have included Damour, a 19th century pioneer in tracing to source through petrography, in his bibliography. I was glad to see a discussion of classic marble provenance studies, a field where Hughes and the BM Laboratory have made important contributions. I thought of these studies when a marble statue attributed to Michelangelo was recently rediscovered in a Manhattan courtyard. Finally, under metal provenance studies he treats the use of lead isotope ratios as well as trace element composition, explaining these to non-specialists with well-chosen examples.

In addition to editing this book, Bowman has contributed the chapter on Chronology, touching carbon 14 dating, where she deals with the modern accelerator technique and the problem of calibrating the C-14 record. She employs some excellent graphics to convey this difficult topic to laymen. As examples she discusses cases of special interest to the BM and to British Archaeology: the chronology of the "Beaker People" and early mining in Wales. Of course her predecessor at the BM, Michael Tite, was heavily involved with dating the "Shroud of Turin", the first high-profile C-14 exercise of the accelerator age. She also discusses thermoluminescence dating, where her colleagues at Oxford have done much pioneering work, and dendrochronology.

Like all museums and many collectors, the BM has for years been obsessed with the detection and unmasking of fake objects - in fact, in 1989 they published *Fake? The Art of Deception* (M. Jones, ed.) which made good reading. A variety of motives exist for faking art or archaeological objects - among them fun and profit - but it is often forgotten that the fake object is also a planted land-mine in the path of the art-historian or archaeologist, ready after years of lying dormant to spring up and blow his reputation to shreds. This alone is good reason

for working so hard to develop modern scientific techniques for the study of objects and to permit the detection of fakes, as chapter 8 brings out. It is certainly not a trivial matter for scholarship. I once had an associate who delighted in faking Sumerian cylinder seals so well that they were invariably accepted as authentic by top scholars in the field (all shall be nameless here). One of the most distinguished professors even offered to write a learned paper about one of the fake seals, surely a pinnacle of accomplishment for the faker. This anecdote is, however, not funny for the museum, and even less so for the scholar in the field. The work presented in this absorbing chapter is useful to both.

The final two chapters open new ground for the public: topics that I am sure have not been brought to the attention of the educated museum visitor. These are the use of computers and mathematics. The use of computers for extracting typological information, the field of numerical taxonomy, is briefly explored, and one regrets that Peter Main has not included David Clarke's great book *Analytical Archaeology* in the reading list at the end. But the chapter must necessarily pick and choose among a rich (and ever richer) body of information on computers in museum science. The final chapter, on the more mundane topic of computerizing the collections, is interesting even though it may have less appeal for many. I am not sure why the topic was included in the first place, but that is not to say that the housekeeping and records of a giant museum are not surpassingly important to those responsible for the objects.

The book as a whole is a fine job of introducing the educated layman to the many and valuable contributions of science and mathematics to the better understanding of the cultures of the past as exemplified by objects in our museums. A famous curator of Greek and Roman artifacts in a very great museum once said "I don't need any science. I have it all up here", pointing to his head. Fewer and fewer curators will be able to say that, with conviction, in the museum of the future.

Ancient Technologies and Archaeological Materials.

Sarah U. Wisseman and Wendell S. Williams (eds.). Gordon and Breach, Langhorne, Pennsylvania, 1994. xi + 250 pp., index. \$50 (cloth); \$25 (paper).

Reviewed by James H. Burton, Department of Anthropology, University of Wisconsin-Madison, Madison, WI 53706, USA

Originating from a team-taught "Materials and Civilization" course at the University of Illinois, Urbana-Champaign, *Ancient Technologies and Archaeological Materials* offers a multi-disciplinary assortment of articles combining archaeology, materials science, and both modern and prehistoric technologies. Comprising three sections: Ancient Technologies, Organic Materials, and Museums and Monuments, the text is intended as supplementary readings for an introductory undergraduate course. It is not a traditional survey of scientific methods or of archaeological materials, but offers instead an extremely diverse sampler of

archaeological problems approached through a wide variety of disciplines. Contributors have kept the technical language to a minimum and suggest, in addition to the cited literature, more extensive references for deeper inquiry.

The first section, "Ancient Technologies & Experimental Archaeology," presents the perspectives of an anthropologist, a field archaeologist, an artisan, and a classical scholar. Contributions in this section try ultimately to show how one can draw inferences about the problems faced by the early artisans and their decision-making processes.

Wisseman's "Pots to People" combines experimental replication of Etruscan and Roman ceramics with traditional typology and literary testimony to reconstruct ceramic technology and organization of production. Although compositional data were not presented, she also briefly discusses results from XRF and NAA studies. She further supplements the technological and compositional data with potters' marks (stamps and graffiti) to assess scale of production and division of labor.

Riley, Hopke, Martin, and Porter offer an example of the traditional use of compositional methods to determine whether formal similarity of Mississippian pottery was due to trade or to diffusion of stylistic concepts. Their results reveal different compositional groups for pots at different sites, implying that pottery was being locally made and stylistically copied. Their discussion of the analysis of their is at a fairly technical level and will require additional information from the instructor about interpreting compositional data and hierarchical cluster diagrams.

Blacksmith-anthropologist Charles Keller, in "Invention, thought, and process", takes a cognitive approach to historic iron-tool production. Recreating iron artifacts from the perspective of a modern artisan, he demonstrates how replication efforts reveal decisions that must be made during the production process. He also discusses how such information is often overlooked by emphasis on analysis of the artifact itself.

Paul Keyser, in what is probably the most original contribution to this volume, reevaluates Hero's steam engine of the first century A.D. Keyser examines Hero's design using 'source-criticism of technology', i.e. by reviewing ancient philosophical and scientific sources for a coeval context. Hero's steam engine preceded the industrial revolution by seventeen centuries, but was never, itself, actually used to produce power. Keyser's study of Hero's designs, as well as of ancient texts that display similar devices, reveals that Hero's engine was not intended to be an efficient power source or a recreational device. It was, rather, designed as a theoretical device addressing key cosmological issues of Hero's time, in a fashion quite analogous to the 'thought experiments' of modern quantum physicists.

In the second section, "Organic materials and the reconstruction of early environments", a paleopathologist, an archaeologist, a CRM manager, and a textile chemist, review modern analyses of bones, seeds, phytoliths, and fibers. Linda Klepinger opens the section with a much needed critique of the chemical analysis of prehistoric skeletal materials. Klepinger discusses the limitations, mainly due to postmortem

effects, of chemical analyses of bones. Although recent work suggests that a few of her examples, e.g., the use of iron to assess anemia, deserve even more skepticism, Klepinger's chapter nonetheless provides a cautionary counterpoint to overly enthusiastic claims about what can be inferred from such studies.

Margaret van de Guchte and Richard Edging, in "Plants and people" introduce paleoethnobotanical methods and their applications. They describe procedures for the recovery of plant macrofossils, pollen, and phytoliths in considerable detail, then discuss how such methods are being applied to understanding the spread of agriculture, environmental reconstruction, and dating.

Textile chemist, Mastura Raheel reviews the histories of flax, cotton, silk, wool, bast, and leaf fibers. She describes each type of fiber, early methods of its preparation, and its uses. A detailed analytical section follows the history, describing characterization techniques such as microscopy, density, and differential solubility. She then presents a similar treatment of the history and identification of natural dyes. Although there are a few oversights in the analytical part, such as giving a table of solubilities without mentioning the solvent, most readers aren't likely to be needing accurate detail to appreciate the various analytical approaches.

In the final section, "Museums and Monuments", a conservation scientist, a curator, and a cultural-resources manager describe non-destructive approaches to authenticity, composition, structure, and preservation.

Just as the book, as a whole, is an introductory sampler, the chapter by Williams, "Science and the art museum", mimics the text as a micro-sampler. He presents nine case studies, ranging from dating and non-destructive authentication methods to the effects of acid rain at Mesa Verde National Monument. Williams offers unusually concise, yet clear, explanations of the physical principles involved in the analytical approaches, why the analyses were undertaken, and how the data addressed the research questions. Just as the text is designed for an introductory course, this chapter could stand alone as reading for a survey lecture.

In the following contribution, "X-Ray vision: the recovery of early Medieval ironwork", Williams and Richard Keen collaborate as physical scientists with art historians, Barbara Oehlschlaeger-Garvey and Henry Maguire, to recover the structure of medieval ironwork. They use X-radiography, again with a clear presentation of the technique, to view heavily encrusted iron clasps and their fine silver decorations. They could thus infer, by a non-destructive method, that the artifacts were manufactured in northern France in the 6th or 7th century A.D.

Eric Freund, in "Saving the monuments of the Athenian Acropolis", debates restoration versus reconstruction of the Greek monuments of the fifth century B.C. He shows how studies of stability and deterioration were used to optimize stabilization approaches. Iron cramps inserted into the Erechtheion for stability actually accelerated structural deterioration and are thus now being replaced by titanium beams. He explores various surface treatments, including methods of chemical exchange and polymer impregnation, to

stabilize the more delicate surface features, now being destroyed by atmospheric acids. He also reports first-aid measures being considered for the Parthenon.

The final chapter, by Wisseman, discusses how mummies can be examined by a variety of techniques to infer the original physical and social setting of the individual as well as dietary information. She emphasizes the use of noninvasive techniques such as X-ray imaging and three-dimensional CT-scans. Although data were not available for this chapter, Wisseman also mentions the use of minimally destructive methods such as isotopic studies and DNA analysis. Inferences from the non-destructive imaging include the age of the individual, its historical placement, and techniques used for embalming.

There is also a brief introductory overview by Wisseman, a biographical sketch of each contributor, a short glossary, and an index. Although Ancient Technologies is designed as an introductory text, the extremely wide scope of the articles insures that the instructor as well as student will find something new. The diversity not only of subjects but of approaches, along with an emphasis on minimizing jargon, well suits this text as an introductory sampler for the layperson interested in archaeology, itself. I'm mailing my dad a copy!

Society for Archaeological Sciences

Income and Expenditure Summary January 1, 1996 to December 31, 1996

As of January 1, 1996:

Bank of America Checking balance	\$13,102.00
UCR Campus Credit Union balance	\$450.59
Total Account Balances	\$13,552.59

Income

Membership Income	\$27,097.11
Other Income	\$59.32
Divident/Interest Income	\$10.75
Total Income	\$27,167.18

Expenditures

Advertising	\$0.00
Annual meeting	\$136.03
Banking Costs	\$490.07
Bulletin printing/postage	\$2,177.12
Miscellaneous	\$3,193.95
Office expense - President	\$100.00
Office expense - Bulletin	\$268.92
Office expense - General Secretary	\$38.21
Postage - other	\$252.10
Printing - other	\$295.18
Payment to Academic Press for JAS	\$17,580.00
Taxes: Federal	\$0.00
State	\$20.00
Total Expenditures	\$24,551.58

As of December 31, 1996:

Bank of America Checking balance	\$15,706.85
UCR Campus Credit Union balance	\$461.34
Total Account Balances	\$16,168.19

Society for Archaeological Sciences 1997 Budget

January 1, 1997 to December 31, 1997

Projected Income

Membership income	\$6,300.00
Interest income	\$10.00
JAS subscription payments	\$18,000.00

Projected total income \$24,310.00

Projected Operating Expenditures

Annual meeting	\$250.00
Banking costs	\$500.00
Bulletin printing/postage	\$3,500.00
Miscellaneous	\$350.00
Office expense - President	\$100.00
Office expense - Bulletin	\$200.00
Office expense - General Secretary	\$500.00
Postage - other	\$500.00
Printing - other	\$400.00
Payment to Academic Press for JAS	\$18,000.00
Taxes	\$10.00

Projected Total Expenditures \$24,310.00

Book Reviews in Upcoming Issues of the *SAS Bulletin*

Learning from Things (W.D. Kingery, ed.), by F. Beardsley
Archaeological Chemistry (A.M. Pollard & C. Heron), C. Kolb
Society, Culture, and Technology in Africa (S.T. Childs ed.), by M. Leney
Arsenic, Nickel et Antimoine (V. Rychner & N. Klantschi), by E. Garrison
The Origins and Ancient History of Wine (P. McGovern et al. eds.), by R. Evershed
Human Adaptation at Grasshopper Pueblo (J.A. Ezzo), by J. Buikstra
Statistics for Archaeologists (R. Drennan), by R. Dewar
Feeding Colonial Boston: A Zooarchaeological Study (D.B. Landon), by B. Baker
Archaeometry: An Australasian Perspective (W.R. Ambrose & P. Duerden),
Archaeometry: Further Australasian Studies (W.R. Ambrose & J.M.J. Mummery), and *Archaeometry: Current Australasian Research* (B.L. Fankhauser & J.R. Bird), by S. Young
Packrat Middens (J. Betancourt et al.), by V. Bryant
Archaeological Prospecting, Image Processing and Remote Sensing (I. Scollar et al.), and *Moundbuilders of the Amazon* (A. Roosevelt), by J. Ebert
Materials Issues in Art and Archaeology II (P. Vandiver et al.), and *Chemical Characterization of Ceramic Pastes* (H. Neff ed.), by W. Barnett
The Industrial Revolution in Metals (J. Day & R.F. Tylecote), and *Early Metallurgical Sites in Great Britain* (C.R. Blick ed.), by D. Killick
Paleoethnobotany (D. Pearsall), by M. Nesbitt
Pottery in Archaeology (C. Orton et al.), *The Art of Stoneworking* (P. Rockwell), and *Vertebrate Taphonomy* (R. Lee Lyman), by T. Oudemans
Materials Issues in Art and Archaeology IV (P.B. Vandiver et al.), by C. Reedy

P.S. This is a friendly reminder to the reviewers!

Meetings Calendar

Susan Mulholland

* = new listings; + = new information for previous listings

1997

- * May 22-24. 3rd International Conference on Soils, Geomorphology, and Archaeology. Ramada Inn, Luray, Virginia, USA. Sessions - Variations in Soil/Archaeological/ Geomorphological Contexts from the Appalachian Plateau to the Coastal Plain; Variations/ Causes/ Recognition of Context Turbations Around the World; Advances in Gimmicks, Gadgets, and Various Technologies for Interpreting/ Reconstructing Landscapes, Environments, etc.; Various subjects relating to integrated uses of pedology, geomorphology, archaeology. William M. Gardner, Dept. Anthropology, Catholic University of America, Washington DC, 20064, USA; tel: 202-319-5080; fax: 202-319-2782.
- * May 22-24. Canadian Quaternary Association (CANQUA) 8th Biennial Meeting. Montreal, Quebec, Canada. Michel Bouchard; tel: 514-343-6821; email: bouchami@ere.umontreal.ca
- * May 27-30. 7th International Congress on Ground-Penetrating Radar. University of Kansas, USA. Richard Plumb; tel: 913-864-7743; email: gpr98@rsl.ukans.edu
- * May 29-June 1. 26th Annual Conference, Society for Industrial Archeology. Michigan Technological University, Houghton, Michigan, USA. Society for Industrial Archeology, Dept. of Social Sciences, Michigan Technological University, 1400 Townsend Dr., Houghton, MI 49931-1295, USA; tel: 906-487-1889; fax: 906-487-2468; email: sia@mtu.edu; web: <http://www.ss.mtu.edu/IA/SIA97.html>
- * June 11-13. Natural Catastrophies During Bronze Age Civilizations: Archaeological, Geological, Astronomical, and Cultural Perspectives. Fitzwilliam College, Cambridge University, England. Benny Peiser, Liverpool John Moores University, School of Human Sciences, Byrom St., Liverpool L3 3AF, England; tel: 0151-231-2490; web: <http://www.knowledge.co.uk/xxx/cat/sis/>
- * June 18-19. Late Quaternary Coastal Tectonics, Geological Society of London. Burlington House, London, United Kingdom. Ian Stewart; email: ian.stewart@brunel.ac.uk or Claudio Vita-Frinzi; email: ucfbvfv@ucl.ac.uk
- July 7-10. Airborne Remote Sensing 3rd International Conference. Copenhagen, Denmark. ERIM/Airborne Conference, P.O. Box 134001, Ann Arbor, MI 48113-4001; tel: 313-994-1200, ext. 3234; fax: 313-994-5123; email: wallman@erim.org; <http://www.erim.org/CONF/conf.html>
- 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 21-25. 17th International Congress of the Int'l Association of Caribbean Archaeologists. Bahamian Field Station, San Salvador Island, Bahamas. John Winter, Molloy College, 1000 Hempstead Ave., Centre, NY 11570, USA; tel: 516-678-5000; email: winjo01@molloy.edu
- 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
- Aug. 5-9. South Seas Symposium: Easter Island in Pacific Context. Christopher Stevenson, ASC Group, 4620 Indianola Ave., Columbus, OH 43214, USA; tel 614-268-2514; fax: 614- 268-7881; email: obsidlab@aol.com.

- Aug. 6-9. 9th Peruvian Geological Congress. Lima, Peru. IX Peruvian Geological Congress Organizing Committee, c/o Sociedad Geologica del Peru, Arnaldo Marquez 2277, Lima 11, Peru; fax: 51-1-261-2362.
- * Aug. 19-24. Canadian Association of Geographers Meeting. St. John's, Newfoundland, Canada. Web: <http://www.mun.ca/geog/> Session: Regional Perspectives on 20th Century Environmental Change. John Jacobs and Trevor Bell, Dept. of Geography, Memorial University of Newfoundland; email: jjacobs@morgan.ucs.mun.ca or tbell@morgan.ucs.mun.ca
- August 28-Sept. 3. IV International Conference on Geomorphology. Bologna, Italy. IV International Conference on Geomorphology, Planning Congressi s.r.l., Via Crociali 2, I-40138 Bologna, Italy.
- Sept. 2-4. Archaeological Sciences '97 Durham. University of Durham, UK. Archaeological Sciences '97, Dept. of Archaeology, University of Durham, South Road, Durham, DH1 3LE, UK; tel: 0191-374-3625; fax: 0191-374-3619; email: A.R.Millard@Durham.ac.uk; <http://www.dur.ac.uk/Archaeology/conf/archSci97.html>
- Sept. 8-12. 12th International Numismatic Congress. Berlin, Germany. Staatliche Museen zu Berlin - Preufischer Kulturbesitz, Munzkabinett, Bodestraße 1-3, D-10178 Berlin, Germany.
- + Sept. 10-13. Metals in Antiquity: International Conference. Harvard University, Cambridge, Massachusetts, USA. Suzanne Young, Archaeometry Laboratories, Harvard University, Peabody Museum, 11 Divinity Avenue, Cambridge MA, 02138, USA; tel 617-495-4388; fax: 617-495-8925; email: SYoung@FAS.Harvard.Edu. Conference topics: Current Research on Ancient Mining and Archaeometallurgy; Mineralogy and Geochemistry of Ore Deposits and Ancient Extractive Metallurgy; Characterization of Ore Deposits for Studies of Provenance and Technology; Reconstructing Ancient Metal Production Processes; Social Context of Ancient Metal Production and Use; Theoretical Aspects of Ancient Metallurgy; Ethnography of Metallurgy; Workshop on Metals Analysis in Archaeology. Web: <http://www.brad.ac.uk/acad/archsci/depart/resgrp/amrg/conf.html>
- * Sept. 14-19. Symposium: The Late Pleistocene in Eastern Europe - Stratigraphy, Palaeoenvironment and Climate. Vilnius, Lithuania.
- Sept. 16-19. Second National Congress on Archaeometry. Zaragoza, Spain. Josefina Perez Arantegui, Dpto. Quimica Analitica, Facultad de Ciencias, Universidad de Zaragoza, Pl. San Francisco, s/n, 50009 - Zaragoza, Spain; tel: 34-76-76-10-00; fax: 34-76-76-12-92; email: jperez@msf.unizar.es.
- Sept. 18-21. 3rd Biennial Rocky Mountain Anthropological Conference. Holiday Inn, Bozeman, Montana, USA. Ken Cannon, National Park Service, Midwest Archeological Center, Federal Bldg., Room 474, 100 Centennial Mall N., Lincoln NE 68508-3873; tel: 402-437-5392x139; fax: 402-437-5098; email: ken_cannon@nps.gov.
- * Sept. 20-23. Workshop: Beringian Paleoenvironments. The Nature Place, Colorado Springs, Colorado, USA. Topics: Glacial Geology of Beringia, Sea Level History, Late Tertiary Origins of Arctic Tundra and Beringian Landscapes, Pre-Sangamon Environments of Beringia, Last Interglacial Environments of Beringia, Last Glacial Environments of Beringia, Paleoclimatology of Beringia, Archaeology of Beringia, Plenary Sessions (Connections between Land, Sea, and Ice Records; Beringian Productivity Paradox Revisited). Abstracts due August 15. Web: <http://culter.colorado.edu:1030/~saelias/workshop/workshop.html>. Scott Elias, INSTARR, CB 450, University of Colorado, Boulder CO, 80309 USA; tel: 303-492-5158; fax: 303-492-6388; email: saelias@culter.colorado.edu
- Sept. 22-26. XII Congreso Nacional de Arqueología Argentina. Facultad de Cs. Naturales, Universidad de La Plata, Paseo del Bosque S/N, 1900, La Plata, Buenos Aires, Argentina. tel: 5421-256134; fax: 5421-257527; email: museo@isis.unlp.edu.ar
- * Oct. 2-5. Society for Industrial Archeology, 1997 Fall Tour. Alexandria, Louisiana, USA. [Features tour of turn-of-the-century sawmill including railroad, plywood and paper mills, locks and dams.] Dr. Lauren B. Sickels-Taves, P.O. Box 597, Natchitoches, LA 71458, USA; fax: 318-352-6619; email: taves@cp-tel.net.
- * Oct. 3-5. 4th Annual Midwest Bioarchaeology and Forensic Anthropology Association. Loyola University, Chicago, USA. Abstracts due June 1. Dr. Anne Grauer, tel: 773-508-3480; email: agrauer@luc.edu
- 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; fax: 303-447-1133.
- * Oct. 26-31. Soil Science Society of America Annual Meeting. Anaheim, California, USA. Web: <http://www.agronomy.org/olr/index.html> or <http://www.soils.org/divs/s9/> Symposium: Magnetic Properties of Soil Minerals - Analysis and Interpretation. Mike Timpson, 2515 North Fort Valley Rd., Apt. 13, Flagstaff, AZ 86001, USA; tel: 520-773-1416; email: miket@infomagic.com
- * Nov. 13-16. 30th Annual Chacmool Conference: The Entangled Past - Integrating History and Archaeology. University of Calgary, Calgary, Alberta, Canada. Nancy Saxberg, 1997 Conference Committee, Dept. of Archaeology, University of Calgary, 9500 University Dr. NW, Calgary, Alberta, Canada T2N 1N4; tel: 403-220-5227; fax: 403-282-9567; email: njsaxber@acs.ucalgary.ca
- * Nov. 16-19. Symposium: Palynostratigraphy at Low Latitudes. Margarita Hilton, Isla Margarita, Porlamar, Venezuela. In association with the 8th Venezuelan Congress of Geology and 1st Latin American Congress of Sedimentology. Laurent de Verteuil, Petrotrin, Trinidad; tel: 809-658-4200/10/20/30, ext. 2317; fax: 809-659-3074; email: devert@petrotrin.com
- * Nov. 18-22. 55th Annual Plains Anthropological Conference. Boulder, Colorado, USA. Douglas Bamforth, Dept. of Anthropology, Univ. of Colorado, Boulder, CO 80309; tel: 303-492-1871; email: bamforth@spot.colorado.edu; Field trip: Magic Mountain and the Lamb Springs site.
- 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.

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- * Jan. 5-8. Royal Geographical Society and Institute of British Geographers. University of Surrey, Guildford, UK. Theme: Environmental Change in the Tropics and Subtropics. Dr. Jane Entwistle, School of Geography, Kingston University, Penrhyn Road, Kingston-Upon-Tames, Surrey, KT1 2EE, UK; tel: 0181-547-2000, ext. 2552; fax: 0181-547-7497; email: j.entwistle@kingston.ac.uk
- April 27-May 1. International Symposium on Archaeometry. Hungarian National Museum, Budapest, Hungary. Katalin T. Biro, Hungarian National Museum, Dept. of Information, H- 1450 Budapest Pf. 124, Hungary; tel/fax: 36-1-2101/338; email: h5852bi@ella.hu; <http://origo.hmn.hu/ametry>.
- 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.
- * Aug. 23-29. 8th International Congress, International Council for Archaeozoology. University of Victoria, Victoria, British Columbia, Canada. Rebecca Wigen, rjwigen@uvvm.uvic.ca or Quentin Mackie, qxm@uvic.ca. Tourism Victoria, 812 Wharf St., Victoria, B.C. Canada, V8w 1T3; tel: 250-382-6539; web: <http://travel.bc.ca=09>.
- Oct. 26-29. Geological Society of America, Annual Meeting. Toronto, Ontario, Canada. GSA Meetings Department, tel: 1-800-472-1988 or 303-447-2020, ext. 133; email: meetings@geosociety.org; <http://www.geosociety.org>

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