



# SAS Bulletin

Society for Archaeological Sciences

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## From the Editor

I hope that everyone had a productive yet relaxing summer. This past spring was a very busy time for many of us; my participation in the Society for American Archaeology conference in Philadelphia in April, the International Archaeometry Symposium in Mexico City in May, and both the XXXVth Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria (Lipari) and the VIth International Conference of the Association for the Study of Marble and Other Stones in Antiquity (Venice) in June left me with little time for research and writing, more or less relaxation! Nevertheless, our NSF-funded geoarchaeological fieldwork on central Mediterranean obsidian sources resulted in the collection of thousands of hand samples which are now being processed and analyzed in order to refine characterization and provenance studies in this region. I report here on several items of importance to SAS members, including our book series, a new relationship with the journal *Archaeometry*, and on the International Archaeometry Symposium held in Mexico City.

### *Advances in Archaeological and Museum Science Series*

Four volumes have been published in the SAS/Kluwer-Plenum series *Advances in Archaeological and Museum Science*, and a fifth volume is now forthcoming. The SAS is soliciting proposals for additional volumes in this series, which covers advances and developments in various topics in archaeometry, archaeological science, environmental archaeology, preservation technology, and museum conservation. Edited volumes as well as monographs are acceptable. Please contact one of the series editors for more information: Martin J. Aitken (Oxford), Edward V. Sayre (Smithsonian), R.E. Taylor (U. California, Riverside), or Robert H. Tykot (U. South Florida).

Previous volumes in the series include:

Volume 5: *Close to the Bone: Biogeochemical Approaches to Paleodietary Analysis in Archaeology*. Stanley Ambrose & Anne Katzenberg, editors. Forthcoming.

Volume 4: *Science and Technology in Historic Preservation*. Ray A. Williamson & Paul R. Nickens, editors. ISBN 0-306-46212-5, April 2000.

Volume 3: *Archaeological Obsidian Studies: Method and Theory*. M. Steven Shackley, editor. ISBN 0-306-45804-7, April 1998.

Volume 2: *Chronometric Dating in Archeology*. R.E. Taylor & Martin J. Aitken, editors. ISBN 0-306-45715-6, November 1997.

Volume 1: *Phytolith Systematics: Emerging Issues*. Susan C. Mulholland & George Rapp Jr., editors. ISBN 0-306-44208-6, May 1992.

All volumes may be ordered directly from Kluwer-Plenum (<http://www.wkap.nl/series.htm/AAMS>), at a discount if you mention that you are an SAS member.

### *Archaeometry Journal*

The Editor of *Archaeometry*, Michael Tite, has announced that beginning in 2001 the journal will be published by Blackwell Publishers on behalf of the University of Oxford, and that there will be four issues per year instead of two. Furthermore,

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## Professor David Kingery

As a close colleague of David Kingery, I am saddened to have to report to you that he died suddenly yesterday (June 29, 2000) in Rhode Island of (as we currently understand) a heart attack. He was 72 years of age.

David was too well known in the archaeometric community for me to have to reiterate his achievements, for which he was awarded the Pomerance Medal of the American Institute of Archaeology in 1998. Archaeometrists may not however be fully aware of his prior career as the father of the field of advanced ceramics, which brought him the Kyoto Prize only last year. I am therefore forwarding an appreciation of him by two colleagues in the College of Engineering at the University of Arizona.

He was truly an intellectual giant, and we shall miss him very much. One aspect of the work of his later years that is less appreciated than his excellent technical studies of archaeological ceramics is his deep interest in the social context of technology - how social forces shape innovation and diffusion of techniques. This thread runs through the series that he edited for the American Ceramic Society, entitled *Ceramics and Civilization*, nine volumes of which have appeared, and in the two conferences that he organized with the Smithsonian Institution on material culture (Kingery and Lubar, eds., *Learning from Things*, and Kingery, ed. *History from Things*). In these he sought to extend the insights of Cyril Stanley Smith, formerly his senior colleague at M.I.T. Through them he has greatly influenced a younger generation of work on the history and prehistory of technology.

*David Killick*

Dear Friends,

It is with deep regret and an immeasurable sense of loss that we write to tell you that Professor David Kingery passed away last night in Wickford, RI.

Professor William David Kingery was Regents Professor of Anthropology and Materials Science and Engineering since 1992 and Chairperson of the Program on Culture, Science, Technology and Society at the University of Arizona which he joined in 1988. Prior to that he had been Regents Fellow at the Smithsonian Institution and Visiting Professor at Johns Hopkins University for one year, preceded by 14 years as Kyocera Professor of Ceramics at the Massachusetts Institute of Technology where he had been since 1951. Professor Kingery's eminence in science and in the relation between science and culture were reflected by the many prizes and honors that he received throughout his career, including, most recently, the 1999 Kyoto Prize in Advanced Technology, and the W. David Kingery Prize, established in his honor by the American Ceramic Society and bestowed upon him in 1998 for "distinguished lifelong achievements involving multi-disciplinary and cross-cultural contributions to ceramic technology, science, education and art." His publications and books had a seminal

influence on the development of ceramic curricula, research and technology throughout the world and he is considered to be the "father" of Physical Ceramics.

Professor Kingery was a member of the National Academy of Engineering, and the American Academy of Arts and Sciences, honorary Ph.D. at the Tokyo Institute of Technology and honorary Sc.D. at the Ecole Polytechnique Federale de Lausanne.

His passing leaves a great hole in the hearts of all those whose life he touched, his family, his colleagues, his friends and his current and former students. Professor Kingery was a great man of our time and he leaves many rich and happy memories with all of us.

*Joseph Simmons, Head, Materials Science and Engineering*

*Tom Peterson, Dean, Engineering and Mines*

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## Society for American Archaeology Awards

The following awards were presented at the 2000 Annual Meeting of the Society for American Archaeology in Philadelphia, and are excerpted from the *SAA Bulletin* 18(3) 2000:

### *Excellence in Ceramic Studies*

The Excellence in Ceramic Studies Award is presented to Owen Rye, whose work on ceramic technology has influenced an entire generation of American archaeologists and ceramic specialists. Rye is currently on the art faculty at Monash University in Churchill (Victoria) Australia, where he serves as teacher, potter, and researcher. Rye's seminal book, *Pottery Technology: Principles and Reconstruction*, published 20 years ago (1981), remains a classic and is regularly used in archaeological ceramic classes throughout the country today. His monograph, *Traditional Pottery Techniques of Pakistan*, coauthored with Clifford Evans and published by the Smithsonian Institution (1976), is an unsurpassed model of ethnographic description and scientific investigation of raw materials and pottery from South Asia. Rye's early articles on ceramic studies, including the whimsically titled "Keeping your temper under control," continues to be as fresh and current as any research on ceramic technology being published today. In short, Owen Rye's work has been as influential to the field of American archaeology since the 1970s and 1980s as Anna Shepard's work has been since the 1950s. And like Shepard's work, Rye's contributions reach beyond archaeology to ceramic specialists in many other fields. It is with great pleasure that the Society for American Archaeology presents this award for Excellence in Ceramic Studies to one of the true pioneers of pottery technology studies, Owen Rye.

### *Award for Excellence in Lithic Studies*

SAA's 2000 Award for Excellence in Lithic Studies is presented to Tom Hester for his major contributions in all facets of lithic analysis. In the morphological and typological realms,

his *Guide to Stone Artifacts of Texas* has served as the principal regional reference for stone tool classification. He also has made important contributions to the topics of mesoamerican core-blade technologies, trace-element studies of obsidian, and ethnographic analogies to archaeological cases. As an early pioneer in low-power use-wear analysis, his studies helped establish this as a viable method. His stratigraphic excavations of lithic workshops at Colha have been instrumental in analyzing lithic production and trade in mesoamerica, and he edited *Lithic Technology* during its evolution into a professional journal.

#### *New Award for Excellence in Archaeological Research and Analysis*

Beginning in 2001, an annual Award for Excellence in Archaeological Research and Analysis will be given as special recognition of excellence by an archaeologist whose innovative research and enduring research contributions have had a significant impact on the discipline. The award recipient will have mastered the difficult challenge of bridging good ideas with empirical evidence or interpretive methods within a particular class of archaeological materials or over a broad range of materials. The award will be given on a cyclical basis, beginning in 2001 with an 'unrestricted' or general category, followed by and replacing the previously separate Ceramic Studies and Lithic Studies Awards.

#### *Student Poster Award*

For the second year in a row, the SAA's student poster award was presented to Diana M. Greenlee of the University of Washington. Her poster was entitled, "Dietary Variation and the Spread of Maize Farming in the Ohio Valley."

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## **Sayre Wins AIA Pomerance Award for Scientific Contributions to Archaeology**

*From the American Journal of Archaeology* 104 (2000): 314:

Edward V. Sayre has advanced the study of archaeology through the development of statistical evaluation techniques and the application of nuclear analytical methods to questions of provenance and trade. Sayre developed the archaeological chemistry program of the Brookhaven national laboratory to apply neutron activation analysis to the study of compositional patterning for a wide variety of material and artifactual types. This made possible a data-based, state-of-the-art study of trade networks, sourcing, and materials identification. He has published over 100 articles in the fields of archaeology, art history, conservation, and the physical chemistry of trace elements and their measurement. Some examples include his work with Phillip Kohl to establish Early Bronze Age trade networks using data from neutron activation analysis of steatite and other soft stones, studies of Aegean trade ceramics (with Maureen Kaplan and others), Sasanian silver (with Pieter

Meyers), Mesoamerican jade and terra-cottas (with Ron Bishop), and Medieval European limestone sculpture and stained glass windows (with Lambertus van Zelst, Jacquelin Olin, and Jean French).

Born in 1919, and 80 years old this past year, Edward Sayre was raised in Iowa, worked on the Manhattan project from 1942 to 1945, and after the war completed his Ph.D. at Columbia University in the physical chemistry of rare earth elements. He worked at the Kodak Research Laboratory for a time and then became a senior chemist at Brookhaven National Laboratory in 1952. His first project, with Ray Winfield Smith, was a study of the compositional categories of ancient glass, which still serves as a framework for the study of ancient glass. In 1956 he helped organize the historic meeting of archaeologists and chemists convened by Homer Thompson and J. Robert Oppenheimer at the Institute for Advanced Study in Princeton, which initiated the application of nuclear methods to archaeological finds. Successful tests of neutron activation analysis led to a landmark study published in the *American Journal of Archaeology* during 1957.

In addition to his duties at Brookhaven, he taught the chemistry of conservation at the Institute of Fine Arts, New York University, for 14 years from 1960 to 1974. With his student Heather Lechtman, Sayre tested the feasibility of the technique of neutron autoradiography and applied it to the reconstruction of artists' working methods. With Pieter Meyers and Lambertus van Zelst, he was the first to apply this technique to paintings in the collection of the Metropolitan Museum of Art, in particular those by Van Eyck and Rembrandt. With Lawrence Majewski he studied the mechanism of deterioration of frescoes by Giotto in Padua, Italy. Later he took an active technical role in the preservation and treatment of artifacts and frescoes when floods devastated Florence in 1965.

Sayre became Director of the Research Laboratory at the Museum of Fine Arts in Boston from 1974 until 1984. After his retirement in 1984, Sayre took on another job - that of directing and influencing archaeological conservation research at the Smithsonian Center for Materials Research and Education. Sayre has been Guggenheim Fellow at Oxford University's Laboratory for Archaeometry and the History of Art in 1969, Distinguished Visiting Professor at the American University in Cairo in 1970, and awarded the Alexander von Humboldt Foundation's fellowship to teach at the Bundesanstalt für Materialprüfung in Berlin in 1980. In 1984 he was recipient of the George Hevesy Medal for Outstanding Contributions to Radioanalytical Chemistry from the American Chemical Society. Last year a symposium honoring him was held at the Smithsonian Institution, with proceedings to be published shortly. He has served on the boards of editors of such publications as *Art and Archaeology Technical Abstracts*, the *Journal of Archaeological Science*, and *Archaeometry*, often for decades at a time. As an innovative scientist and successful teacher, Edward Sayre has been a role model, leading many students to conduct cutting-edge archaeological and conservation science. He has served as a critical mentor to a developing field of archaeological chemistry.



## SAS 22nd Annual Business Meeting

Mexico City (at 32nd International Archaeometry Symposium) 15 May 2000

### Present

Chris Prior (President; Institute of Geological and Nuclear Sciences, NZ), Robert Tykot (Bulletin Editor, U. South Florida), Rob Sternberg (Past President; Franklin & Marshall College), Mike Tite (Oxford U.), Thilo Rehren (U. London), Colleen Stapleton (U. Georgia), Kevin Andrews (U. Bournemouth), Roger Doonan (U. Bournemouth), Bogdan Constantinescu (Institute of Atomic Physics, Romania), Christian Wells (Arizona State U.), Günther Wagner (U. Heidelberg), Jason Wilson (U. South Florida), Don Thieme (U. Georgia), Mark Schwartz (Northwestern U.), Peter Vandenabeele (Ghent U.), Marco Martini (U. Milan), Tania Quevedo (UNAM).

Reports were presented from Treasurer Felicia Beardsley (*in absentia*), Webmaster Jim Burton (*in absentia*), Vice President for Inter-Society Relations Steve Shackley (*in absentia*), Bulletin Editor Robert Tykot, and President Chris Prior.

### Old Business

The magazine, *Scientific American Discovering Archaeology*, will be available at a discount to members who contact the magazine themselves. SAS members on the editorial board of *Discovering Archaeology* should recruit SAS members to write columns on specific topics.

### New Business

The SAS budget was presented for the coming year, and was approved. The future of the journal *Archaeometry* was discussed. Mike Tite explained that next year the journal will move from Oxford to a commercial publisher [Blackwell has since been selected]. The price should be on the order of \$30/year for 4 issues to SAS members. Tite would remain the editor-in-chief and there would be three managing editors. Associate societies would be represented on the editorial board. SAS would recommend a North American editor (we will nominate Steve Shackley). If the German Archaeometrie group participates, it could also recommend an associate editor. Other national/regional groups might participate. Günther Wagner spoke on behalf of the Gesellschaft für Naturwissenschaftliche Archäologie Archaeometrie, and Marco Martini spoke for the Associazione Italiana di Archeometria. Further decisions about these arrangements should be forthcoming.

Academic Press will no longer require all SAS members to subscribe to the *Journal of Archaeological Science*. This journal can still be received at a discount by those SAS members who desire it. *JAS* is also interested in a member of the editorial board from SAS.

SAS still needs Vice Presidents for Intersociety Relations and for Membership Development.

Ann Ramenofsky, who organized the SAS-sponsored symposium at SAA, is interested to publish papers from that symposium. Michael Glasscock (U. Missouri) and Kelly Knudson

(U. Wisconsin) are interested in SAS sponsorship for SAA symposia at next year's meeting.

We briefly considered the possibility of a student member of our Board. The turnover might be too high to be worthwhile.

Chris Prior, Rob Tykot and Rob Sternberg are judging student posters at the current Archaeometry Symposium.

The meeting was adjourned in good cheer.

*Submitted by Rob Sternberg, 1 July 2000*

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## Society for Archaeological Sciences 2000 Budget

January 1, 2000 to December 31, 2000

### PROJECTED INCOME

Membership Income	\$ 7,000.00
Interest Income	\$ 10.00
<i>JAS</i> subscription payments	<u>\$30,000.00</u>
Projected Total Income	\$37,010.00

### PROJECTED OPERATING EXPENDITURES

Annual Meeting	\$ 200
Banking Costs	\$ 800
Bulletin printing/postage	\$ 3,500
Office expense – President	\$ 100
Office Expense – Bulletin	\$ 200
Office Expense – Gen. Sec.	\$ 500
Web Service	\$ 300
Postage – other	\$ 500
Printing – other	\$ 400
Payment to Academic Press for <i>JAS</i>	\$30,000
Taxes	\$ 20
Miscellaneous	<u>\$ 490</u>
Projected Total Expenditures	\$37,010

## Laboratory Profile: Center for Archaeobiological Research National Museum of Natural History

Established in 1992 as a Congressionally approved line item in the National Museum of Natural History budget, the Center for Archaeobiological Research is dedicated to the study of the long history of human interaction with plants and animals, examining both the ecological and cultural consequences of the human exploitation of plants and animals through time. A particular emphasis of the program is the period that spans the earliest evidence of human control over plant and animal species to the development of intensive agricultural economies of complex chiefdoms and early state level societies.

The core staff for the program are Bruce Smith and Melinda Zeder. Dr. Bruce D. Smith, Archaeobiology Program Director, is an archaeologist and archaeobotanist whose research focuses on the origins of agriculture world-wide, particularly in the Americas. Dr. Melinda A. Zeder, Director of the Zooarchaeology Laboratory, is an archaeologist and zooarchaeologist whose research focuses on pre-farming through state level societies in the Near East. The Program's laboratory and curation space is located at the Smithsonian's Museum Support Center. The Center for Archaeobiological Research is comprised of three interlocking components, Interdisciplinary Research, Collections Development, and Educational Outreach.

### Research

The Research Component of the program is dedicated to the study of human interaction with plant and animal species through time. Programmatic research examines the biological and ecological impact of human exploitation on plants and animals, and the reciprocal impact of this relationship on the course of human cultural evolution. The program targets periods of human history beginning with early attempts to domesticate plants and animals, and explores the ecological and cultural implications of the development and intensification of agricultural economies up through the emergence of early urban societies. The geographical focus of the program is global, with special Archaeobiology research emphases in North, Middle, and South America, Western Asia, and Europe. Direct human intervention in the evolutionary trajectories of plant and animal species through the process of domestication brought about one of the most profound ecological transformations in the history of life on earth. The intensification of agriculture that followed the origin of domestication has proven the single most powerful agent in the reduction of biodiversity world-wide. Plant and animal remains recovered from archaeological sites are direct links to the causes and consequences of the origin and proliferation of food producing economies.

Smith is close to concluding a long-term research project on plant domestication and agricultural origins in Mesoamerica centered on the re-analysis and direct AMS radiocarbon dating

of early domesticated plant species recovered from all five of the key Mexican cave sites (Coxcatlan, El Reigo, Guila Naquitz, Romero's and Valenzuela's Caves). He will next turn to a similar reconsideration of long-curved early domesticates from the dry desert coast of Peru, as well as starting in on a book-length consideration of low-level food production economies - the poorly studied conceptual and developmental framework between hunting-gathering and agriculture.

Zeder is currently completing a major project on animal domestication in the Near East, focused especially on the earliest evidence for goat domestication. Zeder used detailed metrical analyses of patterns of sexual dimorphism in wild goat skeletons to develop better methods of constructing sex-specific age profiles from archaeofaunal collections. These methods were applied to the reanalysis of collections of animal remains from sites the eastern fertile crescent (Iran and Iraq) ranging in age from the Late Pleistocene (ca. 35,000 B.P.) to the early Holocene (ca 7500 B.P.). A distinctive shift to selective harvesting of sub-adult males marks the transition from hunting to herding, about 10,000 years ago. Additional information is presented in a recent publication: "The Initial Domestication of Goats (*Capra hircus*) in the Zagros Mountains 10,000 Years Ago," Melinda A. Zeder and Brian Hesse, *Science* 2000 March 24; 287: 2254-2257.

### Collections

The Collections Component of the program focuses on curating the world class collections of archaeobiological materials housed in the National Museum of Natural History. Currently comprised of more than 4000 cubic feet of materials, NMNH archaeobiological collections boast some of the earliest examples of domestic plants and animals in both the Old and New World. The collections of animal remains from Paleoindian sites in North America and from urban contexts in the Near East are without parallel. An aggressive collections acquisition program is underway that seeks to both enhance and expand this strong collections base through the acquisition of targeted collections. Collections development activities are directed primarily toward increasing the accessibility of these important collections to the scholarly community. A corollary project is the development of an International Guide to the location of other archaeobiology collections and data bases that will provide an important service to scholars world-wide.

### Outreach

The outreach component of the program is directed toward promoting a better understanding of the issues that surround the long and complex history of human-plant/animal relationships through time. As part of educational outreach the Archaeobiology Program has served as the host of several large international conferences and more focused workshops that serve as forums for the scholarly community and the public to explore a variety of topics in the history of human interaction with plants and animals. The program also participates in professional organizations representing archaeobiological research, including hosting the new International Council for Archaeozoology (ICAZ) website at <http://www.nmnh.si.edu/icaz/>.

The program also sponsors an active training program for pre- and postdoctoral fellows and interns, giving young scholars the opportunity to come to the Smithsonian and conduct directed research using Archaeobiology facilities and collections. Fellowships are arranged in cooperation with the Smithsonian Office of Fellowships and Grants. Graduate Student Fellowships allow starting graduate students to conduct research for ten-week periods in association with Smithsonian research staff members. Predoctoral Fellowships allow students to conduct dissertation research for periods of three to twelve months. Postdoctoral and Senior Fellowships allow more advanced scholars to conduct three to twelve months of research using the resources of the Archaeobiology Laboratory. Further information about the fellowship programs may be obtained by contacting: Office of Fellowships and Grants, Smithsonian Institution, 955 L'Enfant Plaza, Suite 7000, Washington, D.C. 20560-0902. Phone: (202) 287-3271. Internet: <http://www.si.edu/research%2bstudy/>

## News of Archaeometallurgy

*Martha Goodway, Associate Editor*

The Metals Working Group of the ICOM Conservation Committee has announced Metal 2001, Congreso Mundial de Conservación de Metales, for 2-6 April 2001 in Santiago, Chile. Official languages are English, French and Spanish, and there will be posters but no simultaneous sessions. Information available from Prof. Johanna Maria Theile, Departamento de Teoría, Facultad de Artes, Universidad de Chile, Las Encinas 3370, Santiago; telephone 56-2-6787517; secretary 56-2-6787524. Papers are being handled by Stephane Pennec, Assistant Coordinator of ICOM-CC Metal Working Group, LLP3 Conservation, 8 rue des Tanneries, F21140 Semur en Auxois, France; email [ip3conservation@aol.com](mailto:ip3conservation@aol.com); fax 33 3 80972943.

The proceedings of the previous conference, "Metals 98", held in France, contains sixty papers edited by William Mourey and Luc Robbiola and has been published by James and James for £50/\$75. It is available in North America from The David Brown Book Company, PO Box 5111, Oakville CN 06779; telephone 1-860-945-9329, toll-free 1-800-791-9354; fax 1-860-945-9468; email [david.brown.bk.co@snet.net](mailto:david.brown.bk.co@snet.net). They take Visa, Mastercard and American Express.

*King Croesus' Gold: Excavations at Sardis and History of Gold Refining* by Andrew Ramage and Paul Craddock has just been published as number 11 in the Archaeological Exploration of Sardis Monographs series [ISBN 0-674-50370-8] by Harvard University Press, 79 Garden Street, Cambridge MA 02138 for \$75 plus \$4.50 postage (\$10 by air.) The Press has a web site ([www.hup.harvard.edu](http://www.hup.harvard.edu)), a toll-free order line (1-800-448-2242.), and takes Mastercard, Visa, and American Express.

The proceedings of the conference held at Harvard in September 1997 in honor of Professor K. C. Chang and reviewed in this *Bulletin* (21/1-2, pp. 16-18), "Metals in

Antiquity," edited by Suzanne M. M. Young, A. Mark Pollard, Paul Budd and Robert A. Ixer [ISBN 1 84171 008 3] has been published as BAR-S792 in the BAR International Series and is available from their new distributors, Hadrian Books Ltd., 122 Banbury Road, Oxford OX2 7BP, England, for £60 plus 10% for shipping outside the UK. They accept Visa, Mastercard and Access.

Other BAR publications of interest include *Obtención de Metales en la Prehistoria de la Península Ibérica*, by Pablo Gómez Ramos, which surveys 120 Spanish and Portuguese sites ranging from Chalcolithic to Roman date (BAR S753); and "An Archaeometallurgical Survey for Ancient Tin Mines and Smelting Sites in Spain and Portugal," by Craig Meredith (BAR S714.)

There are several recent French publications and a video bearing on charcoal burning and the industries dependent upon it. *Protoindustries et Histoire des Forêts: Actes du Colloque International tenu à la Maison de la Forêt (Loubières, Ariège), les 10-13 octobre 1990* (Toulouse 1992) is being reprinted and is available for 280FF plus 15FF shipping from GDR-ISARD. Université de Toulouse-Le Mirail, 5, allées Antonio Machado, 31058 Toulouse Cedex, France, telephone 61-50-42-80, fax 61-50-49-10. *Forges et Forêts dans les Pyrénées Ariégeoises: Pour une histoire de l'environnement* by Jérôme Bonhôte focuses on the impact of iron metallurgy on the area. It is available for 248FF plus 30FF shipping from PyrÉGraph éditions, Rue Gambetta, F-31160 Aspet, France, telephone 05-61-88-41-75, fax 05-61-88-41-77. The video, "Les Charbonniers de l'Antola" is oral history of charcoal burning in the Apennines that ceased only in the 1950s, and is available in both French and Italian versions. It is in VHS SECAM, lasts 43 minutes and costs 150FF including shipping from Nathalie Michaud - Centre Audio-Visuel, Université de Toulouse-Le Mirail, 5, allées Antonio Machado, 31058 Toulouse Cedex 01, France.

Indiana University Press may still have Peter R. Schmidt's sixty-minute video, "The Tree of Iron" in stock, as well as his book, *Iron Technology in Africa: Symbolism, Science, and Archaeology* (1997.) Their web site is: <http://www.indiana.edu/~iupress>, toll-free telephone: 1-800-842-6796, fax 1-812-855-7931.

English Heritage has just inaugurated a series of Research Transactions. "Metals: English Heritage Research Transactions Volume I" (1998) contains six papers, on cast iron, wrought iron and lead, with a conservation slant.

The Archaeotechnology column in the *JOM, the Journal of the Mining, Metals, and Materials Society* now being conducted by David J. Killick presented "The decorative bell capital of the Delhi Iron Pillar" by R. Balasubramaniam in the March 1998 issue (pp. 40-47); "The use of tin and bronze in prehistoric southern Indian metallurgy" by Sharada Srinivasan in the July 1998 issue (pp. 44-47, 49-50); "Nails from a 2,400 year old shipwreck: a study of copper in a marine archaeological environment" by S. Shalev, Y. Kahanov, and C. Doherty in the February 1999 issue (pp. 14-17, 20); "Recent insights into the metallurgical technologies of ancient Mesoamerica" by Dorothy Hosler in the May 1999 issue (pp. 11-14); "Melting and sintering platinum in the 18<sup>th</sup> century: the secret of the Spanish" by J. A.



Pero-Sanz-Elorz, J. I. Verdeja-González, J. P. Sancho-Martinez and N. Vilela in the October 1999 issue (pp. 9-12. 41); "Quicksilver for cinnabar: the first documented mechanochemical reaction?" by Laszlo Takacs in the January 200 issue (pp. 12-13); "Initial experiments on arsenical bronze production" by B. Earl and A. Adriaens in the March 2000 issue (pp. 14-16); and "Manufacturing fifth century BC Certosa brooches" by Maria Rosa Pinasco, Enrica Stagno, Maria Giuseppina Ienco, Paolo Piccardo, Roberto Macellari and Frederica Fiori in the June 2000 issue (pp. 13-15.)

A book in the series published by Cambridge University Press *Learning in Doing: Social, Cognitive, and Computational Perspectives* edited by Roy Pea and John Seely Brown, titled *Cognition and Tool Use: The Blacksmith at Work* (1996) was written by two anthropologists, Charles M. Keller and Janet Dixon Keller. Mr Keller is a serious amateur of blacksmithing but I found the Kellers' analysis of the blacksmith's thought processes obvious and the book tiresome, perhaps because I grew up where there was a forge in the backyard.

Otzi, the famous Iceman, is now being referred to more formally as Similaun man and has been installed in the new Museo Archeologico dell'Alto Adige in Bolzano, Italy. The museum is also said to exhibit a reconstruction of the Bronze Age smelting site at Favogna. Has any one seen it? If you have any archaeometallurgical news to share or comments to make, please write or call me.

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## Radiocarbon Dating News

### *Radiocarbon Available Online*

The direct link is: <http://www.catchword.com/rpsv/cw/arizona/00338222/contp1.htm>

Readers with .ac.uk addresses and institutional accounts should use the mirror at <http://pinkerton.bham.ac.uk/rpsv/cw/arizona/00338222/contp1.htm> which will correctly interpret their IP address.

Online access is free for current print subscribers via the above website. Institutional subscribers should click on "Institutional Subscription Activation", and individuals should click on "Individual Subscription Activation". This will take you to an online form to fill in and submit. Your account status will then be verified and access enabled. If you don't have a current subscription, you can buy one online at [www.radiocarbon.org/Orders/orderform.html](http://www.radiocarbon.org/Orders/orderform.html), and then use the above CatchWord URL to gain access to the online journal.

We'll be expanding the service soon, so please let us know if you have any suggestions or concerns. We hope you enjoy reading RADIOCARBON online.

Kimberley Tanner Elliott, *Radiocarbon* Managing Editor, U. of AZ, Dept. of Geosciences, 4717 E. Fort Lowell Road, Rm. 104, Tucson, AZ 85712-1201 USA; tel +1 520 881-0857; fax: +1 520 881-0554; <http://www.radiocarbon.org>

### *AMS Session at the American Geophysical Union*

A special session on AMS will be held at the fall meeting of the American Geophysical Union in San Francisco, CA, Dec

15-19, highlighting the use of AMS in the earth sciences. The title and abstract of the session are as follows:

**Current Research Employing Accelerator Mass Spectrometry** The development of accelerator mass spectrometry (AMS) heralded a new era in the earth sciences and in part, has led to the routine measurement of a suite of isotopes, e.g. <sup>10</sup>Be, <sup>14</sup>C, <sup>26</sup>Al, <sup>36</sup>Cl, <sup>99</sup>Tc, <sup>129</sup>I. AMS has to some extent come of age, is now in its third decade, and is considered a necessary analysis tool. The measurement of natural and man-made nuclides has assisted in answering fundamental questions in the earth sciences. Some of these include, the distribution and variability of oceanic radiocarbon to study circulation and carbon cycling, measurement of specific components isolated from dissolved, sedimentary, or soil organic matter to characterize constituents controlling the carbon cycle, in situ cosmogenic nuclide production to date geomorphic surfaces, the study of groundwater flow and recharge, and detailed paleoclimate chronologies. Papers will present novel methodologies, new data sets, interpretations, and applications across the breadth of the earth sciences.

Co-conveners: Tom Guilderson, Center for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory L-397, 7000 East Avenue, Livermore, CA 94551; tel (925) 422-1753; fax (925) 423-7884 & Department of Earth and Planetary Sciences, Harvard University, 20 Oxford Street, Cambridge MA 02138; [guilderson@eps.harvard.edu](mailto:guilderson@eps.harvard.edu); Sue Trumbore (Department of Earth System Science, University of California, Irvine); Marc Caffee (Geosciences & Environmental Technologies, LLNL); Fred Phillips (Dept. of Earth & Environmental Science, New Mexico Tech).

Website: <http://www.agu.org/meetings/fm00top.html>

### *New URLs for Waikato and Rafter Radiocarbon Dating Labs*

The old Waikato site (<http://c14.sci.waikato.ac.nz/>) has been replaced by a new address: <http://www.radiocarbon dating.com>

Similarly, the page address for Radiocarbon WEB-info has changed from <http://c14.sci.waikato.ac.nz/webinfo> to <http://www.c14dating.com>

The old Rafter address ([www.gns.cri.nz/atom/rafter/rafter.htm](http://www.gns.cri.nz/atom/rafter/rafter.htm)) will still work, but the new URL is less of a mouthful: <http://www.RafterRadiocarbon.co.nz>

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## CSA Web Site Moved and Changed

<http://csanet.org>

We do apologize for any inconvenience, but we hope you will visit the Web site and check out the the database of archaeological projects, CSA projects, the CSA archive, the Lantern Slides of Classical Antiquity Project, the CSA Newsletter, and all the materials intended to aid scholars who are trying to use computers to aid them in their archaeological and architectural history work.

Harrison (Nick) Eiteljorg, II, Director (NEW email address: [nicke@csanet.org](mailto:nicke@csanet.org)) Susan C. Jones, Administrative Assistant (NEW email address: [scjones@csanet.org](mailto:scjones@csanet.org))

(From the Editor, continued)

subscribers will have access to an online electronic version of the journal, and SAS members will have the option to subscribe at the discount rate of \$30 per year.

The journal will continue to aim to cover the interaction between the sciences, both physical and biological, and archaeology, conservation and art history. In addition to standard articles presenting the results of innovative and coherent programmes of research involving either the development of new methods or the application of established methods, the journal will also publish longer review articles as well as short notes, including comments on published articles.

Significantly, following a number of discussions with the SAS and the German Gesellschaft für Naturwissenschaftliche Archäologie Archaeometry (GNAA), Michael Tite has announced that the Editorial Board of *Archaeometry* will be reconfigured, initially chosen by Oxford, GNAA and SAS, but subsequently including other national 'archaeometry' societies associated with the journal. The Editorial Board will appoint from its number three Managing Editors, one from Oxford, one from elsewhere in Europe (initially GNAA), and one from North America (initially SAS). Papers will be submitted to any one of the Managing Editors. The SAS has nominated Steven Shackley (U. California, Berkeley) as the North American managing editor.

#### *International Archaeometry Symposium*

The Archaeometry Symposium was incredibly successful, and we must all express our thanks to the job done by local organizing committee chairman Luis Barba and his colleagues at the Universidad Nacional Autonoma de Mexico (UNAM) and the Instituto Nacional de Antropología e Historia (INAH). This was the first time that the symposium was held in a Spanish-speaking country, and 320 papers and posters were presented in 10 oral and 2 poster sessions over 5 days. Participation was quite diverse, with scholars representing some 30 countries: 44% were from Europe, 39% from the Americas (including 20% from Mexico), and 15% from Asia. In addition to the scientific program, which was held within the fabulous Museo Nacional de Antropología, conference participants were treated to a tour and reception of the Museo del Templo Mayor; the



*Luis Barba*



*SAS business meeting participants included, from left to right: Thilo Rehren (University of London); Günther Wagner (Max-Planck-Institut, Heidelberg); Michael Tite (University of Oxford); Chris Prior (Rafter Radiocarbon Lab, New Zealand); and Marco Martini (Università di Milano).*

Ballet Folklórico de Mexico; a conference dinner with live entertainment; and an excursion to Teotihuacan.

The SAS held its annual business meeting at the conference, which facilitated participation by a broader cross-section of our members compared to alternate years when the meeting is held in conjunction with the SAA meeting. Past president Rob Sternberg's report of the business meeting may be found on page 4 of this *Bulletin*.

Several poster awards were made at the Archaeometry Symposium. The SAS awarded two prizes for Best Student Poster: for session 1, the winner was Oliver Craig (University of Newcastle), with coauthors Matthew Collins and Carl Heron, for their poster "The Origins of Dairying in Europe: New Light on an Old Debate". The second SAS award went to E. Christian Wells (Arizona State University) for his poster "Determining Intraregional Variation in the Chemical Composition of Pottery with Scanning Electron Microscopy: A Case Study from Northwest Mexico." Both winners received an annual membership in the SAS including a subscription to *JAS*. There were many other very fine posters both by students and professionals; the SAS awards emphasized a combination of both scientific methodology and archaeological application and interpretation, as well as the quality of the presentation.

The Martin Aitken poster awards went to Kate Welham (University of Sheffield), with coauthors Caroline M. Jackson and J.W. Smedley, for her poster "The Compositional Homogeneity of Medieval Glasses"; and to Samantha Rekk (Universite Catholique de Louvain), with coauthor Dominique Laduron, for her poster "Regional Clays Study for Provenance Determination of Wares: The Argonne Case."

The Canadian Awards went to Stephanie Dudd (University of Bristol), with coauthors S. Charters, R.P. Evershed, P. Blinkhorn and V. Reeves, for her poster "Organic Residues and Ceramic Analysis: An Holistic Study of the Late Saxon/Early Medieval Pottery of West Cotton, Northamptonshire"; Kate





SAS Student Poster Award winners Oliver Craig (University of Newcastle) and E. Christian Wells (Arizona State University)



A new members signs up with the SAS



Paul Craddock (British Museum) with his Canadian award for best poster.

Welham (see above); Paul Craddock (British Museum), with coauthors B. Craddock, C. Cartwright and W.J. Wray, for his poster “A Hafted Stone Mining Hammer from Chuquicamata, Chile”; and Thomas Schilles (Max Planck Institut), with coauthors J. Habermann and G.A. Wagner, for his poster “Investigations on Feldspar IR-Radioluminescence.”

A website with many digital images of the conference and extra-conference activities has been posted at: <http://srs.dl.ac.uk/arch/Mexico-proceedings/>

The next Archaeometry Symposium reportedly will be held in Amsterdam in 2002. The Standing Committee specifically invites applications from European and American groups for hosting the meeting in 2004 and beyond. Please contact the Chairman of the Standing Committee, Michael Tite, at the Research Laboratory for Archaeology and the History of Art, University of Oxford, 6 Keble Road, Oxford OX1 3QJ, UK; email: Michael.Tite@rlaha.ox.ac.uk



## Prototype Magnetic Susceptibility Logger

Rinita A. Dalan, *Department of Anthropology and Earth Science, Minnesota State University Moorhead, 1104 7<sup>th</sup> Avenue S. Moorhead, Minnesota 56563 USA*

A Technology Transfer Grant from the National Center for Preservation Technology and Training (Grant Agreement No. MT-2210-8-NC-28) supported the development of a prototype magnetic susceptibility logger appropriate for archaeological application. Magnetic susceptibility, defined as the ratio of the magnetization induced in a sample to the inducing field, provides a measure of the degree to which a substance can be magnetized (Banerjee 1981). Investigations of the magnetic susceptibility of soils and sediments can be used to: 1) define sites, activity areas, features, buried soils and cultural layers; 2) build and correlate stratigraphic sequences; and 3) understand how processes of erosion and deposition relate to the archaeological record (Dalan and Banerjee 1998).

Archaeologists currently work with a limited range of instruments for field studies of susceptibility. Those that allow lateral investigations of susceptibility at fairly shallow (<0.5 m) depths are most common. In North America this commonly involves the Geonics EM38 (operated in the inphase mode) and two probes manufactured by Bartington Instruments (the MS2D and MS2F). The susceptibility logger developed as part of this grant allows vertical changes in susceptibility to be measured. While down-hole susceptibility instruments are utilized within the broader geotechnical industry, these are generally not appropriate for widespread archaeological use due to limitations in vertical resolution and the larger bore-holes (2-3 inch diameter) that they require. The prototype logger is unique in that susceptibility values are logged down a small diameter (ca. one-inch) core-hole made with a push-tube corer. Application of this technology thus causes only minimal disturbance to the archaeological record and provide a relatively nondestructive means of exploring archaeological sites. This particular configuration is also advantageous in that it allows measurements to be made very rapidly, approximately 10 times faster than collecting samples from an exposed section or through coring for laboratory measurement. Thus, the susceptibility logger allows archaeologists to cover a larger area or to gain greater spatial resolution. The susceptibility logger can also be employed to gain an understanding of more deeply buried deposits, beyond penetration depths of the EM38 and Bartington MS2F and MS2D probes.

The prototype instrument was built by re-housing a Bartington Instruments MS2F probe, an instrument typically employed in investigations of flat surfaces and sections, so that it could be lowered down a small diameter core-hole. The MS2F sensor was re-housed in a magnetically clean, watertight, electrically and mechanically secure mount and shaft constructed of PVC stock and pipe. The 1.76 m long instrument makes it practicable to log susceptibility to depths of 1.6 m. The probe operates with the Bartington MS2 susceptibility meter, thus providing an expandable system that can be coupled with other Bartington field and laboratory sensors.

The logger was calibrated to allow instrument readings to be converted to absolute volume magnetic susceptibility values and then field-tested on a mid-Holocene stratigraphic section containing an Early Archaic occupation in southeastern North Dakota. Field trials indicated that the logger is comparable in sensitivity to the Bartington MS2B lab sensor (and thus can be used to investigate the same range of materials) and that it produces accurate and replicable measurements of volume magnetic susceptibility. During field trials, the logger clearly distinguished eolian, alluvial fan, and lacustrine sediments and located buried soils within the alluvial fan deposits associated with cultural debris.

The magnetic susceptibility logger expands current capabilities for investigating vertical changes in magnetic susceptibility across archaeological terrains and allows a new means of non-destructively exploring archaeological deposits. My hope is that this instrument will be made commercially available and used more widely in archaeological applications. Those interested in corresponding further about this please contact me at: Department of Anthropology and Earth Science, Minnesota State University Moorhead, 1104 7<sup>th</sup> Avenue S., Moorhead, Minnesota 56563; email: dalanri@mnstate.edu; tel: 218-299-5900; 218-291-4217; fax: 218-236-2593.

This research was supported by a grant from the National Park Service and the National Center for Preservation Technology and Training. This research note is solely the responsibility of the author and does not necessarily represent the official position of policies of the National Park Service or the National Center for Preservation Technology and Training.

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### Recently Published

*Archaeometry* 98. *Proceedings of the 31<sup>st</sup> International Symposium on Archaeometry, Budapest, 27 April - 1 May 1998*. Erzsébet Jerem and Katalin T. Biró eds. Archaeopress, Oxford. 126 papers, 800 pp., 2 volumes. 84.00 GBP. Ordering information for all BAR volumes available on the web at: <http://www.archaeopress.com/>

<sup>14</sup>C et Archéologie/<sup>14</sup>C and Archaeology. *Actes du 3<sup>ème</sup> Congrès International - 3<sup>rd</sup> International Symposium (Lyon 6 - 10 avril 1998)*. J. Evin, C. Oberlin, J.-P. Dugas and J.-F. Salles eds. Mémoires de la Société Préhistorique Française 26 (1999) and Supplément 1999 to *Revue d'Archéométrie*. 480 pp. with 72 articles. 270 FF + 35 FF shipping. ISBN 2-913745-02-4 / ISSN 0399-1237.





## Book Reviews

*Michael D. Glascock, Associate Editor*

**From Hiroshima to the Iceman: The Development and Applications of Accelerator Mass Spectrometry.** Harry E. Gove, Institute of Physics Publishing: Bristol, 1998. 226 pages. \$27.00 (paper). ISBN 0-7503-558-4.

*Reviewed by Michael Paul, Racah Institute of Physics, Hebrew University, Jerusalem, Israel 91904*

*Love story or a physicist's account of his life's work*

Accelerator Dating has become a cliché joke amongst the small but hyperactive AMS community. In his recent book *From Hiroshima to the Ice Man*, Harry Gove, an eminent nuclear physicist and Emeritus Professor of Physics at the University of Rochester, tells us more than a dating encounter. It is the love story of the physicist for his work, the more than twenty-year long adventure of perpetual discoveries in as diverse areas as the Hiroshima bomb, peopling of the Americas or the bizarre story of the Shroud of Turin. There is a common thread between these: whether waiting for the first counts dating the Shroud of Turin or monitoring the neutron flux on a Hiroshima stone, underlies the sense that science is one large field with many facets.

AMS or Accelerator Mass Spectrometry revolutionizes many of these facets. Imagine, as once told me a long-time collaborator, that you pour a bottle, say one kilogram, of a certain radionuclide into the sea and hypothetically mix it thoroughly with all ocean waters of the globe. You will have a concentration of your radionuclide of the order of 10,000 atoms per liter of seawater. This *exquisitely* small amount, to use an adjective Harry Gove is fond of, is detectable by AMS, provided certain favorable properties of the radionuclide. Why a radionuclide and not any nuclide? The reason is that any stable element is most likely present in one liter of ocean water as chemical trace at the level of millions or billions of atoms, completely hiding your own *tracer* if it were also a stable element. Our planet Earth is such that it continuously pours from its atmosphere reservoir into the ocean a radioisotope of carbon,  $^{14}\text{C}$  in the form of carbon dioxide. Every liter of ocean water contains thus of the order of one billion atoms of radiocarbon, becoming an enormous buffer for radiocarbon redistribution.

The atmospheric carbon dioxide finds also its path into the biogenic world through photosynthesis and the now famous Libby's (1952) scheme of radiocarbon dating has become the major dating tool of historical and late prehistorical eras. What has revolutionized Libby's scheme was an idea crystallized in the basement of accelerator vaults by Gove, his colleagues and also by other groups at the same time: these rare atoms could be directly counted and not necessarily detected through their slow decay as Libby had shown. Think that it will take a mean

time of 300 days for one single  $^{14}\text{C}$  atom out of 10,000 to decay, let alone to detect this decay: a modern AMS system is now able to count a good fraction of these 10,000  $^{14}\text{C}$  atoms in a matter of minutes. This created a revolution in the field since it means that very small samples could then be analyzed for radiocarbon.

Harry Gove was one of the main protagonists of the heroic birth time of what was not yet named Accelerator Mass Spectrometry. He tells us, here and for most of the issues he treats in his book, a personal account of the time, the amazement of the first measurements, the realization of their implications, the race for priority and recognition. It was indeed the case for the development of AMS as often happens in science, that the idea matured simultaneously at different places, with different persons. The account given by Harry Gove is, as he himself would not deny, a subjective one. It must be taken this way and in some sense, it makes a much more precious document than would one of forced objectivity, probably any way impossible to achieve for one as personally involved as Harry Gove is. It may be the task of the historian of sciences to disentangle, if it has any importance, the contribution of this or that group.

Together with the historical developments, Harry Gove takes us into the physics of the subject, some technical descriptions of the apparatus involved. One should not view these as a pedagogical textbook, this was not the intention. What drives the text is rather the conviction that the technique, the machines are an integral part of the science, that nothing real can be done without understanding their properties, their limitations.

The core of the book extends over many topics, diverse and interesting. Some of them are dating applications of radiocarbon, others deal with various other long-lived radionuclides, each of them being a truly fascinating story. Much has already been said on the Shroud of Turin, even by Harry Gove himself (1996) in a previous book, *Relic, Icon or Hoax? Carbon Dating of the Turin Shroud*. The author adds here some of his personal feelings in an issue so highly controversial. I doubt that it adds to the scientific evaluation of the case; it just makes it more human. The so-called Iceman, a 5000 years old human body found practically intact in an alpine glacier near the italo-austrian border in 1991, the two-millennia old Dead-Sea Manuscripts, scrolls discovered by shepherds in the nineteen fifties, sheltered from weathering in dry caves of the Judean Desert, a 2000-year old giant egg found by children on a beach of Western Australia, the history of the peopling of the Americas thousands of year before the Columbus and the Vikings, all these are by now fields of study based on radiocarbon dates obtained by AMS and are lively presented. More importantly, Harry Gove often includes detailed and interesting information and data. AMS has expanded now to a large number of other radionuclides:  $^{36}\text{Cl}$ ,  $^{129}\text{I}$ ,  $^{26}\text{Al}$ ,  $^{10}\text{Be}$ ,  $^{41}\text{Ca}$ . The major impact of the University of Rochester group, lead by Harry Gove during momentous years on many of these discoveries and the fields of study which have emerged from them, are brought as vividly.

The message of enthusiasm and love of science which emanates from this book is still the most unique. AMS



practitioners will not read it for the information or the historical value therein, they should read it as a source of scientific drive. Other scientists and laymen will find fascinating the colorful kaleidoscope of fields of study enlightened by the book.

#### References

- Gove, Harry W. 1996. *Relic, Icon or Hoax? Carbon Dating of the Turin Shroud*. Institute of Physics Publishing, Bristol.
- Libby, Willard F. 1952. *Radiocarbon Dating*. The University of Chicago Press, Chicago.

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**Age Determination of Young Rocks and Artifacts: Physical and Chemical Clocks in Quaternary Geology and Archaeology.** Gunther Wagner, 1999. Springer-Verlag: Berlin. 466 pp. \$89.95 (cloth). ISBN-3-540-63436-3.

*Reviewed by Bonnie A.B. Blackwell, Dept. of Chemistry, Williams College, Williamstown, MA, 01267, USA*

With the plethora of dating methods potentially available to archaeologists and Quaternary scientists, a good book that describes the methods, their applications, and limitations is certainly needed. Wagner's book is a 1998 translation of his 1996 German text. Although Wagner has updated some sections with new examples, for the most part the methodological descriptions seem unchanged. Probably due to his European focus, most examples use European, if not German, studies, which may make the book less appealing to North American audiences. Unfortunately, some important English literature pertinent to the subject has not been used by the author, meaning that the treatment lacks balance. Some techniques receive excellent coverage, while others appear not to have changed for 10 or more years, which is certainly misleading.

Several geological and scientific errors and omissions are apparent and bothersome. Wagner states (p. 21) that "recent volcanism is linked to geologic plate boundaries", which patently ignores intraplate hot-spot volcanism, such as Hawaii. Brown and reddish loesses are known rather than just the "yellow to gray" loesses he describes (p. 28). Varves are not limited to "limnic" (limnological) settings (Chapter 2), but also occur in glaciomarine settings also. Groundwater and surface waters with  $^{234}\text{U}/^{238}\text{U}$  ratios  $< 1.0$  are well known also, rather than just those with ratios in the range,  $1 < ^{234}\text{U}/^{238}\text{U} < 12$  (p. 93). Cave "sinters" (i.e., speleothem) often has  $> 1$  ppm U (p. 285), just as some fossil bone and dentine have concentrations  $> 100$  ppm. For either  $\beta$  or AMS counting, precision, in terms of actual years, increases with sample age, rather than remaining constant (p. 154). The Pleistocene and Holocene are epochs not periods (p. 334). Other minor errors include calling branched decay "dual" decay (p. 8), recent uptake "late" uptake (e.g., p. 90), reactants "educts" (p. 296 ff), and flint and chert "silex" or "silices". Wagner states (p. 27) that four alpine glaciations are known, while many European stratigraphers would include five or six advances in the alpine stratigraphy. Occasionally, he makes very provocative statements that leave one wanting more detail (e.g., p.252).

Chapter 1 describes some basic theory underlying dating methods in general. Wagner gives an excellent discussion of the different types of errors associated with dates, unfortunately not using "accuracy" in the way that most Anglophone scientists would apply the term, and introducing a new term "correctness" to replace the usual "accuracy" in the English literature. He also makes very salient points about reporting ages with their associated errors and using units such as BP, a, and ka, but completely omits describing the units y, ky, and their typical usage for time ranges or rates, and uses a and ka for residence times, decay constants, and half-lives instead. Chapter 1 lacks a good overview of the general constraints needed for all dating methods, which would bring a unifying theme to the book and remove some repetition of ideas found in each chapter describing individual methods. One glaring error in this chapter is the statement regarding "dependent" and "independent" methods (p. 4): No dating method can be considered totally independent by his definition, because all methods must be tested through calibration against other dating methods to ensure their applicability to the materials and time ranges for which they are being used.

Chapter 2 presents a detailed list of materials that can be dated by the various methods discussed in the book. While useful as an introduction, it seems somewhat out of place before a discussion of the various methods. The list of potential chronometers is, however, rather incomplete for several materials listed. For example, Wagner omits that sediment can be dated by dating their enclosed fossils by U-series, TL, ESR, amino acid racemization (AAR), palynology, paleomagnetic reversals,  $^{14}\text{C}$ , etc., stalagmites by oxygen isotope analysis, glacial ice, lacustrine and estuarine sediment by  $^{210}\text{Pb}$ , desert varnish and weathering rinds by cosmogenic isotopes, paper by ESR, wood and dripstone covering petroglyphs and rock art by U-series, while phytoliths, eggshells, dentine, calciche, and calcrete are theoretically datable by ESR, and slags by U-series.

Chapter 3 presents a detailed discussion of K/Ar,  $^4\text{He}/\text{U}$ , and their sister techniques. Generally, the discussion here is good to excellent. For example, Wagner notes (p. 66) that while K/Ar achieves precisions of  $< 1\%$ , accuracy rarely matches that level, but fails to note that most K/Ar dates in the geological and archaeological literature quote only the precision for their associated uncertainties. He dances over the problem that most K/Ar dates on whole rocks have proven highly inaccurate. He presents some interesting archaeological examples for K/Ar dating, including Olduvai, but neglects to note in these examples, that these dates will never be the "final word", due to the site's importance. For Figure 17, it would have been nice to see a site map noting the sampling localities.

Chapter 4 discusses the U-series methods. Here a number of errors and omissions were evident. Figure 22 (p. 83) only shows the most common isotopes in the series and misses all the branched decay paths. For most methods, analysts only measure 4-6 isotopes, rather than the whole list given by Wagner (p. 87). Spikes vary depending on the selected isotopes to be used to calculate the ages. Wagner totally omits a very contentious and vitally important debate between Schwarcz and Ku in the early 1990's about the best way to construct  $^{230}\text{Th}/^{234}\text{U}$  isochrons for detritally contaminated samples, and illustrates

the isochron application with outmoded isochrons (e.g., Figure 26, p. 90) or only half of the isochron (e.g., Figure 30, p. 103). The archaeological applications here are rather old examples, but important nonetheless.

Chapter 5 discusses various methods based on cosmic nuclides, ranging from the well known  $^{14}\text{C}$  to the poorly known  $^{32}\text{Si}$  and  $^{81}\text{Kr}$ . Well illustrated with clear diagrams, this chapter offers a reasonably complete overview of the numerous methods and their applications, including an excellent discussion of the various effects affecting  $^{14}\text{C}$  age determinations. Wagner, however, does not mention Stafford's successful methods used to clean bones for  $^{14}\text{C}$ , or the use of  $^{10}\text{Be}$  to recognize sediment recycling through subduction zones. While quoting several enrichment ages for  $^{14}\text{C}$  dating examples, he does not mention that most of these are usually considered invalid due to contamination problems.

Chapter 6 details the fission and “-recoil track dating methods. Here Wagner's personal expertise shines through making for interesting and informative reading.

Chapter 7 discusses the dating methods based on radiation dosimetry, TL, OSL, and ESR. Again Wagner's expertise in TL and OSL are evident in well illustrated, detailed descriptions and examples. Except for giving credit to Valladas and Godfrey-Smith for their development of TL for burnt flint and OSL respectively, few important details are omitted. Unfortunately, Figure 106 shows a growth curve with only five points, which would not be acceptable to the TL/OSL/ESR dating community as the basis for a date.

He paints a rosier picture for OSL than it currently enjoys, by only mentioning the problems associated with pretreatment protocols, unbleachable components, and single crystal techniques in passing. Unfortunately, the ESR section has some rather glaring omissions and errors: For example, he has misrepresented the first ESR dating attempts (actually by Übersfeld *et al.* in 1954), dating range for tooth enamel (currently ~10 ka to 4 Ma), and the typical precisions (now enamel 4-6%, others 8-10%), while failing to credit Ikeya (consistently cited as “Ikea” in the text) for having first applied ESR dating successfully and later developed it significantly, and giving the wrong dating equation (Equation 48 is only used rarely, because ESR dose rates usually vary with time). Contrary to Wagner's understanding, ESR rarely uses pretreatments, but instead uses post-irradiation annealing to remove unstable signal interferences, and usually uses multiple aliquots. He does not mention the MnO standard used in many labs, and completely ignores the whole tooth techniques for non-destructive dating and the isochron method used for tooth enamel and fault gouge to determine variable external dose rates. Except for a few recent examples, the ESR method described is that used in 1986 not 1996 or 1999.

Chapter 8 discusses several methods that depend on chemical alteration rates. Given that this chapter includes the really obscure glass lamellae, F and Ca diffusion methods, why Wagner considered lichenometry beyond the book's scope seems mysterious. For the more obscure methods, it would have been nice to see references less than 15-30 years old. While his discussion of the basic geochemical principles is good, he errs on significant details, especially in amino acid racemization

(AAR): For example, AAR does indeed depend on weathering parameters for bones and teeth, but does not obey fully first-order linear kinetics for bone, dentine, enamel, and some molluscs in natural environments. Therefore, contrary to Wagner racemization rate constants and racemization orders do vary with tissue type and species for molluscs. Glycine has no asymmetric carbon atom. He glosses over the species and subsampling location problems in molluscs, and virtually ignores aminostratigraphic approaches. Also, ignored is the early developmental work by Hare, the developments for modern molluscs by Goodfriend, the development work on wood by Vlahos, and the bone and tooth diagenesis problems, especially in recent saline lakes. Significant work to correlate Quaternary marine and loess sequences in North and South America are also omitted. Figure 121 has been drawn with the wrong mathematical function to define the change in AAR ratio and reversing the  $x$ -axis so that it increases to the left, making the graph appear backwards to its usual presentation. Table 8 fails to support his assertions about F-U-N analysis, principally because the data are presented without precisions and detection limits making it impossible to assess correlations. Again, the AAR is presented as it was practiced in 1986, with insufficient updates to make it current.

Chapter 9 discusses paleomagnetism. With several diagrams and detailed explanations, this chapter covers the topic well and presents some interesting archaeological and stratigraphic examples.

Chapter 10, which briefly discusses orbital and climatic records, and their dating applications, seems to have been added on as an afterthought. While it supplements the examples presented in some other chapters, the brevity here does not allow Wagner to raise some of the more detailed issues arising from these methods. Palynology receives particularly short shrift.

Unfortunately, the book is plagued by typographic, spelling, and grammar errors that detract from the book's readability. For example, Milankovic (p. 397 and others), molluscs (p. 54 and others), kilometres, “stack” water (slack water, p. 383), among others are misspelled. Grammatical retentions from the original German occur in several locations (e.g., p. 57, 118, 180, 303, 309, etc.), making for very confusing English syntax. Some unusual quasi-Germanic words occur, including the hyphenated adjectival “electron-spin-resonance” (p. 24) and “temporal temperature variations” (p. 312), as so some unusual punctuation (e.g., p. 26). A few are more problematic, such as not capitalizing Quaternary Period and Late Glacial, which have specific geochronological definitions in the English literature, but capitalizing Glacial when glacial should be used. The style is decidedly wordy, and at times hard to follow, especially for the non-geochronologist. In several chapters, a few more diagrams would help to illustrate concepts that might be unfamiliar for some readers or difficult to follow due to the textual style.

North Americans archaeologists, however, may be alarmed by the constant use of the terms “Man” and “early man” (e.g., p. 1, 198, etc.) where the taxonomic designation, or the terms “anthropogenic”, “human”, “early human” would appear less sexist. One hopes that the failure to credit several women, Jewish, and Japanese researchers with various developments is merely

an oversight. He is also firmly wedded to the less politically correct terms, “AD”, and “BC” (e.g., p. 146), rather than “CE” and “BCE” now preferred by most American archaeologists.

In general, the book is useful as a general reference for some dating techniques, K/Ar, TL, OSL, fission track, but for ESR and AAR it falls far short of the standard. As a textbook at any level, its many small and a few large errors combined with poor overall coverage would require the instructor to supplement it with significant amounts of outside readings.

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**Grasshopper Pueblo: A Study of Archaeology and Ancient Life.** Jefferson Reid and Stephanie Whittlesey. University of Arizona Press: Tucson. 1999. xiv+186 pp., 32 photos, 8 illustrations, index. Price: \$29.95 (cloth) ISBN 0-8165-1913-7 or \$15.95 (paper) ISBN 0-8165-1914-5.

*Reviewed by Michael D. Pool, Anthropology/Geography Department, Austin Community College, 7748 Hwy 290 W., Austin, TX 78733 USA*

As an alumnus of the University of Arizona Field School at Grasshopper Pueblo, I looked forward with great anticipation to reviewing this book, and it generally met my expectations. Any shortcomings are due to its brevity and its attempt to satisfy both the general public and professional archaeologists. The authors attempt to summarize knowledge about life at Grasshopper Pueblo and document the history of research for current and future researchers, while at the same time crafting a story for the non-archaeologist. This latter goal is aimed specifically at the White Mountain Apache and other Native American peoples, as well as non-Indians interested in understanding southwestern prehistory. Additionally, the authors describe archaeology fieldwork at the field school in order to educate the public about the process of archaeology.

The book parallels the development and evolution of Grasshopper Pueblo with that of the field school. Both have an establishment phase, then an aggregation phase, followed by a disaggregation/depopulation phase, and lastly, abandonment. This metaphor is followed throughout much of the book with events reconstructed for the prehistoric period paralleled by events of the field school. Chapter 1 discusses the environmental and social context and general history of the pueblo and the field school. Chapters 2 and 3 discuss the establishment and aggregation phases. Then, Chapter 7 outlines the dispersion and abandonment phases. Chapters 4-6 are the meat of the book for archaeologists. They outline the conclusions of thirty years of research at Grasshopper Pueblo. Chapter 5 discusses the subsistence ecology of both the pueblo and the immediate region. Chapter 6 outlines the sociology of Grasshopper Pueblo. Lastly, Chapter 6 discusses ideology, religion, and art.

Before A.D. 1275, mobile foraging and horticultural Mogollon inhabited the Grasshopper region. During the latter part of the 13<sup>th</sup> century, the Great Drought forced some of the Anasazi off the Colorado Plateau and into the Grasshopper region, where precipitation was better. Three small excavated pueblos represent this period: Chodistaas, Grasshopper Spring, and an incipient Grasshopper Pueblo. These partially masonry

20-room pueblos reflect the development of full sedentism forced by the influx of population, resulting in increased competition for resources and an atmosphere of tension and uncertainty. Chodistaas is characteristically Mogollon, while Grasshopper Springs, its contemporary, is Anasazi. Around A.D. 1300, Chodistaas and Grasshopper Springs pueblos were abandoned, and aggregation began at Grasshopper Pueblo.

The period between A.D. 1300 and 1330 saw significantly increased precipitation. At the same time Mogollon pueblos in the region increased in size to 100-1000 rooms. Grasshopper Pueblo grew into a 500-room pueblo. Room Block 3 appears to have been inhabited by people from Chodistaas Pueblo, and Room Block 2 inhabited by the original Grasshopper Pueblo population. Across the old channel of Salt River Draw, the Anasazi inhabitants from Grasshopper Springs Pueblo lived in Room Block 1. The differences in ethnicity are marked by differences in ceramics, architecture, head shape, and burial behavior. Two examples are the distribution of bird burials and head shape. The east village of Room Block 1 (Anasazi) contains only formal turkey burials, while the west village of Room Blocks 2 and 3 (Mogollon) contain formal burials of red-tailed hawks, golden eagles, and macaws and the remains of blue-feathered and black-feathered birds. Vertical occipital deformation marks Mogollon burials in Room Blocks 2 and 3, and lamboidal deformation marks Anasazi burials in Room Block 1.

The household appears to have been the basic unit of organization, and there appears to be no evidence of a hierarchy. Inter-marriage and societies/sodalities integrated the pueblo. There is clear evidence for four all-male societies, including the preeminent “Arrow” society. These societies were delineated through the differential but patterned distribution of burial goods, including bundles of arrows. One burial of a high status male under Plaza 3 (later converted into a Great Kiva) indicates that membership, as well as leadership, in more than one society was possible. In this case, the individual appears to have been leader of both the “Arrow” society and the “Bone Pin” Society.

The authors also suggest there is the possibility of a dual division, or moiety, organization between the east village and the west village. However, it seems just as likely that these differences are purely ethnic.

The establishment period marks the transition from a prior semi-sedentary, foraging and horticultural subsistence pattern to one fully dependent on agriculture in the aggregation phase. The consequences of this transition are seen in the burials recovered from Grasshopper Pueblo. There are widespread skeletal abnormalities indicating chronic as well as acute food shortages and anemia. There are also a high number of dental abnormalities, including caries, abscesses, tooth loss, and interrupted dental enamel development. There was also an extraordinary infant mortality rate; 56% of the burials are infants.

The evidence suggests that Grasshopper Pueblo did not participate in a complex long-distance, large-scale trading system and so, did not require an elite to manage valuable commodities. Manufacturing seems mostly oriented to domestic and ceremonial consumption. The only evidence for manufacturing export items is turquoise pendants and pottery. Evidence for importation is sparse and includes macaws (imported as adults), copper bells, and shell ornaments.



A prolonged drought marked the period between A.D. 1330 and A.D. 1355, and the population at Grasshopper Pueblo appears to have begun a process of seasonal dispersion and mobility by part of the population in response to these conditions. During this same period, cliff dwellings, such as Canyon Creek Pueblo, appear in the region. A number of outliers of partial masonry construction and generalized habitation activities represent the seasonal aggregation of dispersed households at Grasshopper Pueblo. In addition to the construction of outlier room blocks, Plaza 3 was converted into a Great Kiva, showing an increased need for social integration.

From A.D. 1355 to 1400, dispersion increased until finally Grasshopper Pueblo, and, ultimately, the region, was abandoned. Then, like the pueblo, the field school abandoned the work and facilities for fresher grounds after the 1992 field season.

*Grasshopper Pueblo* is an outstanding success as a non-technical introduction to a prehistory of a portion of the American Southwest and to archaeology in general. As a publication for professional or serious advocational archaeologists, it is less successful. I can only hope that this is not the end of publication of the thirty years of research at Grasshopper Pueblo. Something, at least on the level of the now ancient *Multidisciplinary Studies at Grasshopper Pueblo* (1982), is needed.

While reading the book several things nagged at me. A comprehensive bibliography of the thirty years of research would be extremely helpful, not only for current researchers but for future ones (but one has been published elsewhere: Reid 1999). While the authors sketched out the arguments for their conclusions, there is not a full development of these arguments.

Lastly, I kept running into the disorientation that different perspectives can cause. My perspective is from the Mimbres and Reserve branches of the Mogollon in southwestern and west-central New Mexico, so some of the encompassing statements in this book struck me as, at the least, not quite right. When I limited these statements to the Grasshopper region, they made more sense.

I particularly have a hard problem with the idea that the Anasazi brought "a more sophisticated dry-farming technology and a stronger commitment to corn agriculture." This may be true for the Grasshopper region but is not for the Mimbres branch and probably not for the Reserve branch. The relatively sudden increase in population size and density strikes me as more than enough to explain the shift to increased sedentism and dependence on agriculture, whether or not the increase resulted from endogenous or exogenous processes.

The fact that Reid and Whittlesey argue that the Anasazi needed to bring more sophisticated knowledge of and commitment to agriculture to explain the increased sedentism and agricultural dependence in the Grasshopper region is debatable. The resident Mogollon practiced horticulture for hundreds, if not thousands, of years before the influx of Anasazi, and it seems likely that they had a more sophisticated knowledge of agricultural practices in their environment and cultigens that were better adapted to the mountain environment of the region. Besides, what is the more sophisticated knowledge the Anasazi brought? The evidence for intensification of production is limited to checkdams and linear borders, things that are ubiquitous throughout the Mogollon area and the Southwest.

In the end, these picayune flaws do not seriously detract from the information and story presented in this book. It provides a good introduction to the research at Grasshopper Pueblo for the non-archaeologist and researchers not familiar with the American Southwest, especially Grasshopper Pueblo or the Mogollon.

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**Clovis Blade Technology: A Comparative Study of the Keven Davis Cache, Texas.** Michael B. Collins; with a chapter on microscopic examination of the blades by Marvin Kay, University of Texas Press, Austin, 1999. xii + 234 pp., 82 figures, 2 tables, glossary, index. \$40.00 (cloth). ISBN 0-292-71215-4.

*Reviewed by Harry B. Iceland, Department of Anthropology, Florida Atlantic University, Boca Raton, FL 33431 USA*

This book makes an important contribution to a newly revived debate on the significance of the Clovis phenomenon and the timing and migration routes of the peopling of the New World more generally. The current interest in Clovis extends beyond the ever-attractive subjects of the finely-flaked fluted points and mammoth kill sites to include distinctive Clovis attributes that have sometimes been overlooked: caching, the use of exotic lithic materials, bone and ivory artifacts, and core-blade technology. New finds and new interpretative approaches also take place against a backdrop of skepticism towards the romantic notion of specialized Clovis big-game hunters and the nearly complete acceptance of the existence of earlier, pre-Clovis immigrations to the New World.

This book has three parts. The first part begins with a discussion of blade technology. The various aspects of prismatic blade production are explained and illustrated with an excellent series of schematic drawings and by photographs of the replicative work of knapper Glenn T. Goode, along with Goode's insightful commentaries on his craft. The discussion of Clovis lithic technology that follows deals briefly with biface production, but focuses heavily on core-blade technology, as might be expected. This section contains a table of 42 Clovis sites and references used for this study that will be useful for those pursuing further research on the subject. The table highlights the uneven regional distribution of Clovis blades, however, as only one of the sites listed is found east of the Mississippi (Dust Cave, in Alabama). The scarcity of blades in eastern Clovis assemblages is puzzling, especially since the blade-like flakes preferred for Clovis point blanks may, according to the authors, be products of the same core-blade reduction sequence as the prismatic blades, which were not used to make points. The discussion of Clovis blade technology in this section is thorough and well-illustrated with photographs (including macrophotographs) and

drawings of cores, early stage blades, and blade-making debitage, but the end products of blade production, such as thick bifaces and end scrapers on blade segments, are discussed much more briefly.

The second part deals with the Keven Davis cache site (41NV659), in east Texas, a find of 27 Clovis prismatic blade fragments and nearly complete blades exposed in 1988 during earth-moving preceding the creation of Richland-Chambers Lake (which now covers the site) and recovered during subsequent fieldwork. Laboratory analytical methods are described in considerable useful detail. Refitting helped reconstruct the post-depositional scattering of the cached blades, primarily by plowing earlier this century. Sixteen quantitative variables for each blade (after refitting) are presented together with comparable data for blades from 21 other Clovis sites. The resulting table will be extremely useful for analyses of future Clovis blade finds, as will the detailed qualitative descriptions of the individual Keven Davis blades.

Part two also contains a chapter by Marvin Kay that presents the results of his microscopic analysis of the cached blades. This analysis focused on post-depositional damage as well as possible use-wear. The results of his study are not dramatic; evidence of use prior to caching is minimal. Kay's methodology, however, which he explains in considerable detail, is state-of-the-art, and will be of considerable interest to those engaged in the frustrating business of lithic use-wear analysis. His approach to the study of microwear utilizes polarized light Nomarski optics that provide three-dimensional views of remarkable clarity. The resulting photomicrographs are extremely well-reproduced and presented with contextual information concerning scale, placement on the artifact, and orientation of use-wear features that greatly contribute to our ability to follow his interpretative arguments.

Part 3 consists of comparative analyses of Clovis, possible Clovis, and non-Clovis blade assemblages and a discussion of caching behavior. Bivariate (length and width) and trivariate (length, width, and thickness) scattergrams of individual blades from Keven Davis and 24 additional sites permit visual comparisons of blade morphology by site, while technological characteristics (bulbs, platforms, ripple marks), are discussed site by site in the accompanying narrative. The combined results convincingly support the author's conclusion that Clovis blade assemblages can be distinguished from non-Clovis assemblages and that the Keven Davis blades are likely Clovis in origin.

Caching is another distinctive characteristic of Clovis culture. A variety of artifacts have been reported for Clovis caches, sometimes in combination: large Clovis points, preforms, ochre, exotic stone materials, blades, cores and bone objects. The purposes of such caches in Clovis contexts are not well understood, even as to whether they were primarily ritualistic or utilitarian. The author suggests, however, that in a lithic resource-poor region, such as east Texas, where the Keven Davis site is located, such caches may represent a banking strategy associated with seasonal rounds.

Until recently, it was assumed that the distinctive fluted dart points considered diagnostic of Clovis culture must have developed from lithic traditions that originated in eastern Siberia, the source of the earliest migrations to the New World at the

end of the Pleistocene, ca. 11,200 BP. The now widespread acceptance of a pre-Clovis occupation at the Monte Verde site, in southern Chile (in which the author has taken a lead role), combined with new finds and interpretations of late Pleistocene human skeletal remains, have opened the door to reconsideration of early dates for other sites, sources of migration other than northeast Asia, and routes other than the Bering land bridge. The author does not hesitate to discuss the implications of these developments for the origins of Clovis blade technology. "It seems plausible," he notes, "that Clovis blade technology is ultimately derived from the often very similar ones in Upper Paleolithic cultures of Eurasia," specifically the southwestern European Aurignacian and Solutrean traditions. If this were the case, however, we would expect to find Clovis blades at least as frequent in eastern North America (closer to their "point of entry") as in the west. I would have liked to have heard more of the author's views on two additional issues for which hard evidence is admittedly extremely scarce. If Clovis blades and flake-blade Clovis point blanks represent stages in the same core-blade reduction sequence, as he suggests, why (again) are blades largely a western North American phenomenon, while Clovis points are found throughout the east? A second fundamental issue involves the ultimate purpose of Clovis blade production. The author notes briefly that they could be "utilized intact or segmented and retouched into end scrapers and other forms." Why then the distinctive blade technology and morphology, especially in light of the supposed functional advantages of the Clovis dart point? In this respect, the new finds at the Gault site, presented in a Postscript, seem especially promising.

Likely the author felt that enough speculation was enough. The strengths of this fine book are its exhaustive hard data, systematically and creatively presented. The finds at the Keven Davis site are examined in the widest possible analytical and comparative contexts. The methodologies employed by Collins and Kay should serve as a framework for the investigation of other Clovis blade assemblages, perhaps, ultimately, permitting further, informed speculation concerning the big issues of the Clovis phenomenon.

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**Human Impact on Ancient Environments.** Charles L. Redman, University of Arizona Press: Tucson, 1999. xiv + 239 pp., 9 photos, 46 figures, 1 table, index. \$45.00 (cloth) or \$22.95 (paper). ISBN 0-8165-1962-5.

*Reviewed by Arjun M. Heimsath, Department of Earth Sciences, Dartmouth College, Hanover, NH 03755 USA*

Charles Redman's book opens by raising some of the fundamental questions underlying our quest for understanding how humans inhabit and interact with the Earth. Are we in the process of destroying our means of existence, can we achieve natural resource sustainability in the true sense, and is our habitation as dire as environmental doomsayers would have us believe? While such questions are hardly answerable, and the author does not claim to answer them here, this book does

provide an approachable, easily read framework from which to ponder such questions. Specifically, it outlines and expands briefly upon some of the most enigmatic case studies of prehistoric human impacts on different regions of the Earth and uses the case studies to suggest a means of understanding the present course of human societies. Rather than simply listing examples of prehistoric human impacts by geographic or chronologic arrangement, Redman uses the archaeological studies to underpin his thesis that human impacts on the environment have been significant across spatial and temporal scales.

This organization that enables the author to convey the widespread nature of human-environmental interrelations without slipping into the monotony of presenting case study after case study makes this an ideal book for engaging potential students of archaeology, anthropology, the earth and environmental sciences, and the like. *Human Impacts* dovetails especially well with recent books that have broken remarkably well into popular reading circles: Flannery (1994) and Quammen (1996) expose readers coherently and eloquently to the human causes of Pleistocene and recent species extinctions, while Diamond (1997) has logically composed an excellent argument for how the world's societies emerged through direct interactions with their specific natural environments. While I found each of these books illuminating and quite enjoyable to read, they did not offer the archaeological perspective presented by Redman that more directly connects human impacts with the physical environment.

Prior to reviewing the strengths of this book's approach toward the physical landscape, it is worth noting that Chapter 4, "Animal Exploitation: the prehistoric loss of habitat and biodiversity", provides a good summary and introduction to the human causes of species extinction. It is also important to note that the author does not provide a thorough literature review in this, or other chapters. Some of the most glaring omissions are of the detailed scientific work that have enabled such work to progress. For example, perhaps the best evidence we have of the coincidence in timing between human impacts and megafaunal extinction is from Australia. In recent work Miller et al. (1999) (which obviously could not have been cited by Redman, but the precursors are equally important), present compelling evidence from three separate methods of dating sediments and egg shells that shows that at least one megafaunal extinction coincided with human occupation of Australia.

The Australian example is particularly important because it decouples the impact of humans from the potential effects of the Pleistocene climate fluctuations. Redman does make the important point that while megafaunal extinctions have corresponded to ice ages earlier in the Pleistocene, the scale of North American and European extinctions at the end of the last ice age far surpass earlier climate changes and are therefore more easily attributable to human impacts. If Redman had used the Australian example, or even the example of the Moa, a giant, flightless bird hunted to extinction by the Maoris in New Zealand roughly a thousand years ago, his case would have been as clearly presented as Flannery's (1995) was. An important refutation to the climate change proponents of the megafaunal extinctions is that the New Zealand Moa healthily survived the

last ice age and *Genyornis* went extinct before the climate changed.

Understanding the role of humans on animal and plant extinctions is a fundamental look into human impacts, but the topic has been extensively reviewed elsewhere and therefore was not intended as the emphasis of this book. I think of this book as a good and thorough introduction to further study on the effects of humans on their surroundings. The specific case studies are presented with enough depth to provide interested readers direction to delve more deeply into any given topic, yet without the detail that would make the text read like a review of a multitude of papers. I especially appreciate *Human Impact* for the chapters that delve into human attitudes, both contemporary and historical, toward the environment (Chapter 2), the conceptual frameworks that we employ to examine the environment, or any problem (Chapter 3), and the conclusion that does a good job showing how lessons from the past can be applied to the future (Chapter 8). These three chapters provide the bulk of what I consider unique contributions of this book.

While Chapters 2 and 3 may appear relatively elementary in their treatment of topics such as trophic levels, energy pathways in natural systems, and the water cycle, they are meant to be introductions to readers unfamiliar with the physical and biological sciences. As such, they are presented with simple diagrams and highlighted keywords that are likely to make readers comfortable with new concepts and terms. Naturally, the compromise is to appear simplistic to more experienced readers, but we are familiar with such trade-offs. With these chapters, Redman is contributing to the education of new scholars who will hopefully use scientific tools to examine socially pertinent issues.

Buried in these introductory chapters are also many concepts that any scholar of the environment must bear in mind. One example is the question of a *pristine* environment. Or, as I have come to phrase it, the *reference state*. That is, the almost unknown condition of an environment that has not experienced any human impacts. We don't know the answer to this, and Redman does well to highlight this, and the question of what is an *ideal* environment, as important issues to keep in mind while reading the book, or evaluating other case studies. A second example is the concept of the value of the environment. That is, what are the "real costs" of using up, polluting, or otherwise impacting any part of the environment. Too often economic analyses fail to account for the more insidious and far reaching effects of particular industries, developments, or other human activities and it will help further analyses of human impacts to be aware of such costs.

The remaining work is far from being uninteresting. In fact, it was the promise of the remaining work that attracted me to the book in the first place. These are the specific examples of how humans have, in the cases presented here, harmed their surroundings. In the four chapters that present case studies of recent archaeological studies there are endless paths upon which curious readers can tread further. Indeed, I will use the book as an overview text for a course on how science leads to the lines of evidence that Redman presents through his various case studies. Redman organizes these case study chapters according to the nature of human impact, such that extinctions and habitat



destruction (Chapter 4) precede agricultural practices (Chapter 5), which in turn leads naturally to urban growth (Chapter 6) and the implications of an increasingly complex society (Chapter 7). Readers of *Guns, Germs, and Steel* will feel especially comfortable with the latter two chapters and will appreciate the way Redman weaves his conceptual framework through the text.

Perhaps my greatest disappointment with this book was that there weren't more detailed case studies, or that some of the most intriguing studies were only mentioned in passing. One of the strengths that Redman used was to be able to compile a broadly applicable range of case studies to highlight the human impacts, but some expansion of the actual archaeology involved for us to be aware of such ancient impacts would have been insightful. This insight would fuel the imagination of students beyond the sparks created by the fascinating subject matter. To be fair, Redman does present some very good detail in places, such as discussion of how agricultural terracing has been used to extend the arable landscape, or a presentation of a pollen diagram to show how it can be used to decipher changes in vegetation in the Levant as a function of societal change. And, if the details that all interested scholars would be looking for were presented, then *Human Impacts* would not be as approachable and concisely constructed as it is.

Putting together such a book is an enormous task and for it to be as readable and broadly applicable as it is speaks highly of the scholarship of the author. As an overview text, it provides an important piece in the emerging picture of how our species has repeatedly squandered natural resources (the poignant tale of Easter Island, told in Chapter 1, provides a lucid example), and how we are continuing to do so. The book is a good text for courses somewhat familiar with the sciences and interested in exploring how humans have co-existed with the Earth. It also provides an essential companion for books such as the below that explore the topic from other perspectives.

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**People, Plants, and Landscapes: Studies in Paleoethnobotany.** Edited by Kristen J. Gremillion, The University of Arizona Press, 1997. 296 pp, includes references and index. \$29.95 (paper). ISBN 0-8173-0827-X.

*Reviewed by Linda S. Cummings, Paleo Research, Golden, CO, USA*

Gremillion's book is a collection of papers honoring Dr. Richard A. Yarnell, the 1992 recipient of the Frixell Award for

Interdisciplinary Research, awarded at the annual meeting of the Society for American Archaeology in Pittsburgh. All of the papers are thoughtful and well-polished contributions to this volume. The book is divided into two parts: the archaeological record of plant domestication and utilization and plant resources, human communities, and anthropogenic landscapes. The majority of the papers address paleoethnobotanic studies focusing on the southeastern United States. Some papers have a more general focus, addressing concepts of paleoethnobotany applicable world-wide. One paper provides an overview of North America, while another discusses anthropogenesis in Japan. This book is a worthy addition to any archaeobotany library.

Kristen Gremillion writes a succinct preface outlining the origin and scope of this book and providing glimpses into its content. Gremillion leads the way with an introduction discussing the development and research potential of paleoethnobotany, reviewing some of Richard Yarnell's vast contributions to the field. She also provides an excellent chapter overview in the introduction, which serves to guide the reader towards topics of particular interest.

Bruce Smith wrote the forward that discusses, briefly, the rich diversity of the studies presented.

#### Part I

Patty Jo Watson writes "The Shaping of Modern Paleoethnobotany," providing a quick review of paleoethnobotany in Eastern North America.

Kristen J. Gremillion re-evaluates the Newt Kash Shelter paleoethnobotany record ("New Perspectives on the Paleoethnobotany of the Newt Kash Shelter"). Her discussion of seed morphology and origins of agriculture provides a good synthesis of this topic and points to future potential of this record to contribute to documentation of agricultural origins.

In "A Three-Thousand-Year-Old Cache of Crop Seeds from Marble Bluff, Arkansas" Gayle J. Fritz describes the various types of seeds, radiocarbon ages returned on the seeds, and presents plausible reasons for differences in sizes. She also addresses the four issues of date, pace, place, and importance in early eastern agriculture.

C. Wesley Cowan tackles "Evolutionary Changes Associated with the Domestication of Cucurbita pepo, Evidence from Eastern Kentucky." He discusses remains recovered and their dates, as well as morphology of remains, and provides a discussion by time period. Certainly this review provides excellent guidelines for comparison of remains from other areas with this excellent record.

Gary Crawford writes "Anthropogenesis in Prehistoric Northeastern Japan," covering the past approximately 9500 years. This review of a record spanning several millennia on the other side of the world from most of the works in this book, discusses the record of both grass cultigens and weedy charred grass remains.

#### Part II

"Between Farmstead and Center, The Natural and Social Landscape of Moundville" by C. Margaret Scarry and Vincas P. Steponaitis is a discussion of the agricultural economy of this polity. Corn cupules, hickory nutshells, and acorn nutshells are

the major components of the paleoethnobotanic record. Box plots of mathematical transformations of the data are used to compare quantities of these three types of remains. These authors interpret the effect of people living at Moundville on the surrounding landscape and consider their requirements for natural resources.

Bruce Winterhalder and Carol Goland present "An Evolutionary Ecology Perspective on Diet Choice, Risk, and Plant Domestication." Their alternative perspective uses evolutionary ecology models, considers nonnormative properties of environmental variables that affect subsistence adaptations, and identifies key processes or actions taken by individuals that affect domestication. They discuss the Diet Breadth Model, Diet Selection and Domestication, Evolutionary Ecology and Risk, Foragers, Sharing, and Exchange, Food Producers and Field Dispersion, and Subsistence Risk during Domestication. Then they apply these factors to a discussion of Plant Domestication in Eastern North America. The authors offer an important reminder that people did not change from foragers to agriculturalists in a single generation. People did not face choices at the extremes of these strategies.

"The Ecological Structure and Behavioral Implications of Mast Exploitation Strategies" by Paul S. Gardner provides basic nutritional information on hickory, acorn, and maize. He considers factors other than forest productivity that influenced the role of mast in the human diet. Yield, processing cost, harvest period, and storage all were examined. He discusses secondary consequences of behavior designed to improve nut harvests and the effects of this behavior on availability of other resources. Paul puts forth a powerful argument for considering behavior associated with increasing yield of nut crops, such as opening the forest canopy, when interpreting subsistence evidence including both seeds and nuts.

Gregory A. Waselkov discusses "Changing Strategies of Indian Field Location in the Early Historic Southeast." He presents several historic drawings while discussing primarily Cherokee and Creek agriculture from the southern Appalachians through modern Alabama, Georgia, Florida, and north-central Gulf coast. This article provides important information and documentation of field location strategies.

In the final chapter, Julia E. Hammett addresses "Interregional Patterns of Land Use and Plant Management in Native North America." She also examines historic documents to establish land use patterns. Julia Hammett identifies some resources and plant families exploited in a wide variety of locations across North America.

Overall, this volume presents a variety of methods, theories, interpretations and discussions that provide rich food for consideration by other archaeobotanists. I recommend this book as a potential for use in archaeobotany classes, since it provides excellent material for a wide variety of discussions. The writing styles vary significantly, resulting in some chapters that are easily read and understood and others that are far more obtuse. This book is very appropriate as a spring board for ideas for many workers in the fields of archaeobotany and paleoethnobotany, as well as those archaeologists wishing to consider issues of landscape, relationships between human occupants of an area and their surroundings, and human exploitation of plants.

**Geoarchaeology: Exploration, Environments, Resources.** Pollard, A. Mark (ed.), 39 authors, Geological Society Special Publication no. 165. The Geological Society: London. 1999. 180 pp, 72 figures (includes plates), 12 tables, 13 bibliographies, index. Price: US\$?? (hardcover). ISBN: 1-86239-053-3; ISSN: 0305-8719.

*Reviewed by William E. Boyd, School of Resource Science & Management, Southern Cross University, Lismore, New South Wales 2480, Australia.*

This well produced and impressive volume of papers arose out of the Geoarchaeology session at the Geosciences '98 Conference held at Keele University, England, in April 1998. It presents a range of geoarchaeological case studies, with a focus largely on the application of geochemistry and geophysics to archaeological problems. In doing so, this volume contributes to the geoarchaeological literature by providing detailed and valuable working examples to complement both the broader sweep of geoarchaeological textbooks such as Rapp & Hill's 1998 *Geoarchaeology*, and the less focussed collections of studies published in journals such as *Geoarchaeology*. In this regard, it plays a similar role to thematically-specific volumes such as Lasca & Donahue's 1990 *Archaeological Geology of North America*, Bell & Boardman's 1992 *Past and Present Soil Erosion* and Brown's 1997 *Alluvial Geoarchaeology*.

Pollard introduces the volume with a brief but useful synthesis of geoarchaeology, drawing attention, as many have done previously, to the diversity inherent within the discipline of geoarchaeology and, with that diversity, the difference of opinion as to the relevance of certain analytical techniques to geoarchaeological research. Drawing on the general practice, articulated through the editorial policy of the journal *Geoarchaeology*, of viewing geoarchaeology as the application of geological sciences to archaeological and of not circumscribing the limits of geoarchaeological research, Pollard appears intent on placing geophysical and geochemical research firmly within remit of geoarchaeology. This, of course, gives credibility to the studies published here. It is my opinion that the volume succeeds well in achieving this intent.

The volume is organised under three headings which provide the subtitle: exploration, environments and resources. Oddly, although the contents list is organised under these headings, and Pollard's introductory remarks are likewise organised, the chapters are published consecutively without any break between major topics. This, in fact, works well, especially since the clear division between exploration, environment and resources as major themes begins, as may be expected, to merge from the very start. As with any volume of papers derived from a conference, thematic coverage is constrained. In this case, however, this constraint is more than made up for by the depth of the studies, and by the value of these detailed worked examples in both reporting specific geoarchaeological research and providing potential direction for other unrelated studies. Geographically, the papers largely encompass British studies (Yorkshire, Shropshire, Liverpool, the Scottish Southern Uplands, Dartmoor, the Bristol Channel, Cornwall and Ireland), with only three beyond this region (France, South Africa and

the South Urals). In terms of archaeological periods covered, examples are drawn from across the spectrum: one early Quaternary example of the study of an Australopithecine site rather contrasts the other Bronze Age, Iron Age, Romano-British, Roman, medieval and historical examples, all of which reflect the dominant interest in metal technologies. In terms of metal technologies, the papers deal specifically with the sourcing of alluvial tin and iron ore, the processing of iron, lead, copper, alum and brass, theoretical considerations of industrial furnace technology, and the use of gold, silver and lead in artefact manufacture. However, topics such as the mapping of subsurface structures, the analysis of buried soils, and the provenancing of historic ship ballast are also discussed. To address all of these, and this is perhaps where the greatest strength of this book lies, a wide range of analytical techniques are discussed and their use illustrated. These encompass many commonly-used geological techniques, thus supporting Pollard's claim for these to be valid geoarchaeological methods. Amongst geophysical techniques discussed, magnetic measurements include fluxgate gradiometry, magnetic susceptibility and resistivity, high resolution microgravity survey and magneto stratigraphy. Geochemical analyses include elemental and mineralogical determinations using XRF, EDXRF, ICP-MS and TIMS (read the volume to find out what these acronyms stand for!), in addition to long-established methods of reflected light microscopy and petrographic analysis. Examples are also provided of the use of pedological, palynological, soil-micromorphological and soil faunal studies, and applications of particle size analysis, SEM and radiocarbon dating.

At this point in most book reviews, it is customary to pass comment on the quality and utility of the volume being reviewed. I consider that a valuable gauge of quality and utility is the speed at which a new book departs my office into the hands of students, and, conversely, the speed at which it returns: a fast departure and slow return is usually a positive indicator of quality and utility. Suffice to say that this book departed my office in a hurry, and the writing of this review was delayed as my students made good use of the volume. The methodological discussions and extensive reference lists will undoubtedly assist their research, and the quality of production will provide good example for their own written work. This volume is a timely and valuable text which importantly complements both general and specific texts emerging in the geoarchaeological literature.

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**Riddle of the Bones: Politics, Science, Race and the Story of Kennewick Man.** Roger Downey, Copernicus-Springer Verlag: New York, 2000. 216 pp., 2 photographs. Price: \$25.99 (cloth). ISBN 0-387-98877-7.

*Reviewed by Albert A. Dekin, Jr., Department of Anthropology, Binghamton University, PO Box 6000, Binghamton, NY 13902 USA*

Sunday, 28 July 1996, at the hydroplane races on the Columbia River in Kennewick, Washington, a human skull is found, and serendipity once more changes the course of

archaeology. Up until now, the telling of this tale has been a "thing of shreds and patches," told in pieces and in places that prevent an easy understanding. This book provides an important context for understanding the story not solely as a scientific and legal struggle but as an unfolding human drama of conflict and concern.

It is easy to cast the issues that surround Kennewick Man in terms of a clash of paradigms, between the scientific and the humanistic. It is easy to follow the legal bases for each position, one firmly founded in the "history as resource" camp and the other based on the case for "human rights". It is easy to see the unfolded events of the discovery and the ensuing legal struggles as a play of self-interest, insensitivity, and insufficient care. But it is harder to see this "riddle of the bones" as the interplay of all of these aspects in a history that is contingent upon the events and the players in a specific time and place. It is this context that the journalist, Roger Downey, provides in this book. While those who were there may disagree on events, motivation, and attitude, Downey provides a thicker description of the players, the events, and the contingencies that are usually lacking or has been narrowly portrayed in other accounts and reports. Contingent history is not "clean" history. It is troubled by the detail of human action and reaction. It is mired in the nuanced interactions among people dealing with the complex interests of emotion, self, turf, notoriety, authority and power. A complicated context never seems to go away and short-term fixes never seem to stay.

There is some light of day here. The Department of Interior answered the question "who owns the past" by acknowledging authority and responsibility, since the concept of ownership is a legal one, and moving forward deliberately. On the question "what does this mean," there are now several paths to knowledge that may lead us to data for interpretation and understanding. On the question "who gets to say," Downey contributes to several forums that can support an informed discussion.

There is some darkness of night here. The Table of Contents lists such chapters as "Injun Trouble", "Clovis the Barbarian", and "How the West was Won", clearly outside of what passes for sensible, if not politically fruitful, discourse. The intellectual context for early human studies is shaped somewhat haphazardly to provide a justification for the intellectual value of the Kennewick controversy, each example replete with how political or social circumstances have influenced the way the data were obtained or interpreted.

"It wasn't long after meeting Jim Chatters that Jeff Van Pelt had him figured for a hustler. Not that Van Pelt had a problem with that: He'd been hustling himself, long as he could remember. No, what graveled was the way that Jimmie always tried to dress his hustle up as Science" p. 31.

For some readers, the journalistic genre may prove unpolished, unprincipled, unverifiable, undisciplined, and unnecessary.

There is ample evidence for the exploitation of minority populations in the United States and elsewhere by what appear to be otherwise well-meaning people espousing scientific methods for the public good. There are well known and documented cases where the civil rights of individuals and groups were systematically violated, whether these people are



economically disadvantaged, ethnic minorities, immigrants, the sick, the incarcerated, the military, or Native American. It is these violations that the Native American Graves Protection and Repatriation Act (NAGPRA) was intended to redress – NAGPRA is human rights legislation – not cultural/historical. NAGPRA is about power, participation, and the light of day. Moreover, NAGPRA is not some 11<sup>th</sup> step in a 12 step program for Native American self-esteem. NAGPRA was fully intended to change the balance among interests, then as now dominated by science as a privileged way of viewing the world.

Hence it should be no surprise that the debate surrounding these issues has been joined not just in the archaeological literature, but nearly everywhere, as the national social, legal and political debates each find something to interest them in the Kennewick controversies.

Archaeologists should not be surprised by any of this. For every example of controversy and lost opportunity, there are examples of successful collaborations among archaeologists, developers, federal agencies, and Native Americans both before and after NAGPRA. Finding common ground is made difficult by competing stakeholders, but where common interests can be recognized and where understanding of the social construction of meaning and value can be respected and serve as a common platform for discussion, then fruitful collaboration is possible, even in the face of NAGPRA, ARPA the DCA, etc.

This book is required reading if you want to see other pieces of these issues, at least as viewed from a place where some still regard archaeologists as the “cowboys of science.” Like it or not, the value placed on archaeology by the public is shaped not so much by what we write as by what others write about us.

*Additional note: In 1982, Professor Dekin directed the Utqiagvik Archaeology Project under whose auspices well-preserved human remains from a 500 year old archaeological context within the present city of Barrow, Alaska, were excavated, autopsied, analyzed, and reported. The cooperation of the communities of Barrow, of archaeologists, of physicians, of engineers and of sponsors (Bureau of Indian Affairs, National Park Service, Atlantic Richfield Foundation, and the North Slope Borough) made possible an increased understanding of early populations in Barrow – direct antecedents of the present Inupiat community. By negotiated understanding, the human remains were treated with respect and, following the autopsies, reburied in Barrow. The artifacts and records are curated at the Inupiat Heritage Center in Barrow.*

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**The Urban Economy during the Early Dominate: Pottery Evidence from the Palatine Hill.** J. Theodore Peña, BAR International Series 784: Oxford, 1999. viii + 231 pp., 38 figures, 15 tables, 3 appendices, index. (paperback). ISBN: 1-84171-004-0.

*Reviewed by Danielle A. Parks, Department of Art History and Archaeology, University of Missouri-Columbia, Columbia, MO 65211 USA.*

Peña has selected a single deposit, A (105), from the Palatine East excavations in central Rome as a test case to evaluate the potential of the ceramic evidence from this site to elucidate a key period in Roman economic history and to assess various quantitative techniques. The transition from High to Late Empire (also known as the Dominate) is marked by a series of economic reforms. The evidence is primarily textual, as the archaeological record is not well documented for this important period. Deposit A (105), including some 512kg of pottery, dates to AD 290-315 (or perhaps even more narrowly to AD 290-300), and this publication comprises one of only a few detailed discussions of a ceramic deposit for this time period.

In his introduction, Peña explains that he has selected this particular excavation unit for its date and because it appears to be relatively undisturbed. The analysis of A (105) will permit him to settle upon an appropriate methodology which can then be extended to the vast mountain of pottery from the site that still remains to be analysed. Aspects under consideration include appropriate classification of the material remains and their quantification, and an attempt to estimate the economic value that they represent. The results garnered are then set against the larger picture of Rome's economy during the Early Dominate.

Chapter 1 examines the textual and material evidence for the urban economy of AD 290-315, focusing on the supply and consumption of three major consumable commodities, wine, oil, and fish products, and of the products of the pottery craft, categories reflected in Deposit A (105). Transport amphorae were often the means by which wine, oil, and fish products reached the Roman market from their production points, though as Peña clearly points out, one can not disregard the use of containers that did not survive in the archaeological record, such as wooden casks and leather bags, when evaluating the relative importance of various sources. As particular amphora types are associated with specific sources, and often with specific commodities, their presence and numbers can be a measure of the trade or state-subsidised supply in these items. Table, utilitarian, and cook wares, however, were purchased for themselves rather than their contents, and therefore the study of these items examines the mechanisms of the pottery industry. With regards to the consumables, all important components of the Roman diet, the author estimates the annual urban consumption and the number of amphorae involved to deduce the scale of the supply organisation. He then proceeds to the evidence for the supply system, the mechanisms for distribution, and the extent of state involvement for the period of the High Empire and for the subsequent Early Dominate. The contrast between the two periods demonstrates the extensive reorganisation of the economic infrastructure and increased involvement of the state in the aftermath of the political and economic upheavals of the latter 3<sup>rd</sup> century. His approach for the ceramic industry is slightly different, and based on models of nucleated workshops proposed by Peacock (1982). Peña suggests a series of supply zones — urban, suburban, extra-urban Italian, and extra-Italian — whose relative success in the market depends on their ability to meet production and distribution costs and the prices that their products would command. Having very clearly established the background to

the problem and his working hypotheses, Peña then proceeds to the evidence of Deposit A (105) itself.

Chapter 2 summarises the ceramic finds from Deposit A (105). After establishing the opening and closing dates of the context, as well as its nature, Peña then explains the methodology employed in the analysis of the pottery. The vessels are divided into functional categories (amphorae, table and utilitarian wares, and cook wares), subdivided on the basis of fabric, and finally by form. Each sherd is also judged to be either primary to the deposit, or residual, that is, redeposited from elsewhere. He has opted for several quantification techniques so as to maximise the compatibility of his data with that from other sites. For each functional group, sherd weight, sherd count, rimsherd count, number of vessel rims, and a total estimated number of vessels are reported. Furthermore, Peña also attempts to assign an economic value to each functional group. For the amphorae, this is related to their contents and therefore to their capacities, which are calculated on the basis of their profiles. The other wares are evaluated on the basis of the amount of raw materials and labour entailed in the reconstructed operations necessary to produce each vessel. All results are reported in extensive tables. In the catalogue, amphorae are organised by their original contents (wine, oil, fish products), and then by place of origin, while the other wares are grouped by fabrics, reflecting their place of origin. The catalogue is not intended as an exhaustive exposition of every vessel represented in the deposit, but rather describes representative examples, assisted by well-drawn profiles. The entries very helpfully summarise the state of scholarship concerning origins, contents, and chronologies for each class, particularly the amphorae. My only criticisms (and they're relatively minor) concern the table/utilitarian wares. The use of the term Form to refer to fabrics or wares is confusing, as the term has been traditionally applied to specific vessel shapes. It is also not always readily apparent when specific forms, particularly among the finewares, correspond to previously studied groups, as Peña likes to rename fabrics. Instead of citing such correspondences in the discussions on chronology and provenience, it would be helpful to mention them at the heading for each Form, perhaps in parentheses after Peña's label for the group. Finally, and this applies to the deposit as a whole, it is not clear what proportion of the ceramics present in the context were actually recovered at the time of excavation. Although this catalogue is preliminary, and only addresses the contents of a single deposit, it demonstrates the importance of this site for Roman ceramic and economic studies: three new amphora forms have been identified, and the chronologies for certain amphorae and finewares refined.

Chapter 3 begins with an assessment of the relative merits of each method of quantification, discussing the respective inherent biases. Peña then places the material from Deposit A (105) in the context of studies of other contemporary ceramic groups, few of which are published in sufficient detail for an in-depth comparison. The results from this one deposit indicate that there is a narrowing of the supply base of the commodities in question during the early Dominate. The amphorae present suggest that west-central Italy, the Straits of Messina, and Asia Minor are the major providers of wine, barring those sources that employed perishable containers. The products of Gaul,

Adriatic Italy, Crete, Campania, and Latium no longer figure. Oil sources have similarly been restricted, and include the three North African provinces of Zeugitana, Byzacena, and Tripolitania, and possibly Spanish Baetica. There is evidence for possible state involvement in the supply of both of these commodities to the Roman *urbs*. Fish products are arriving from Zeugitana, Byzacena, and Lusitania, via private merchants. The sources of the ceramic vessels have likewise been reduced, with approximately one-third imported from Zeugitana and Byzacena. Italian products account for the remainder, with at least 5% derived from extra-urban workshops. Neutron Activation Analysis has been implemented to explore the relative roles of urban, suburban, and extra-urban workshops, and the final results should illuminate the state of the Late Roman Italian pottery industry.

The volume also includes three appendices. Appendix 1 presents the textual evidence concerning state involvement in Rome's wine supply during the second half of the 4<sup>th</sup> century, and is meant as an addendum to Chapter 1. Fabrics are assessed macroscopically in Appendix 2, which is to be used with Chapter 2. Appendix 3 is devoted to a detailed discussion of the economic measures of amphorae and the other wares, including several useful tables of capacities.

Peña's volume is valuable on several levels. As an excavator, I find his system of pottery classification and thorough evaluation of quantification techniques germane. The catalogue has already produced contributions regarding the chronologies and origins of individual classes of amphorae and finewares. However, what I found particularly appealing was the thorough discussion of the sources relevant to the economic picture of Rome during the Early Dominate, with the author's models clearly expressed and organised. This has resulted in a good view of the city's economic situation at a period of crucial transition, and has merit not only for the scholar of Roman ceramics and of Roman economic history, but for anyone interested in the potential of economic studies based on archaeological evidence. I look forward to seeing the results of the monumental task of assessing the rest of the ceramic evidence from the Palatine East excavations.

#### Reference

Peacock, D.P.S. 1982. *Pottery in the Roman world: an ethnoarchaeological approach*. London.

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**Corn in Clay: Maize Paleoethnobotany in Pre-Columbian Art.** Mary W. Eubanks, University Press of Florida: Gainesville, 1999. xvi + 249 pp., 135 figures, 8 tables, 3 appendices, index. Price: \$49.95 (cloth). ISBN: 0-8130-1669-X.

*Reviewed by Mary Ruth Hynes, University of Illinois, Urbana-Champaign, Urbana, IL 61801 USA*

Seldom are multidisciplinary approaches in archaeology presented in such a comprehensive and informative manner as to make a book of interest to the layperson as well as to the academic. *Corn in Clay* is just such a book. It provides the

nonarchaeologist with insights into the collaborative efforts among the fields of art history, botany, and archaeology, and demonstrates how museum collections and previous artifact analysis can be used to address newly stated research questions. For the archaeologist, the author provides a well-written synthesis of her study from start to finish; each time I found myself posing a question of her work, it seemed to be answered within the next few lines.

Eubanks' study is essentially a botanical one, focused upon the representations of various maize species on ceramic vessels from the Mesoamerican Zapotec and Peruvian Moche cultures as a means of addressing the question of cultural contact, and the development and distribution of maize species in this Latin American region. Culture contact between Mesoamerica and South America has been an occasional, recurring topic of discussion, but this study is the first to look at the morphological features of maize on vessels and compare them to the known archaeological specimens. Identification of the maize species in conjunction with other stylistic attributes on the ceramic vessels, supports the authors' conclusions that the contemporaneous cultures of the Zapotec and Moche had contact with each other in some form during the period between AD 600-900.

The maize representations can be divided into two categories: those made from molds and stylized representations. The maize cobs made from molds are characterized by the pairing of the kernel rows and the patterns they produce, along with the size and shape of the ear, as well as the variability in the size and shape of the individual kernels. In contrast, the stylized representational maize cobs are depicted with a more homogeneous row pattern, kernel size and shape. The authors' focus is on the mold-made variety of which her sample of Moche (n=72) and Zapotec (n=56) vessels consisted of specimens examined in numerous museums worldwide.

The mold-made maize cobs are produced by a two step process. The clay is first placed over the actual maize ear, dried and then fired. Clay is pressed into this fired form to produce a positive image from which the molds were then created. In experimental studies, Eubanks estimated shrinkage of the morphological features to be 10% for the complete two step molding process. In the statistical analysis, the shrinkage factor did not affect the assignment of maize species. Species identification was made using cluster analysis of morphometric measurements (such as of row number, ear length and diameter, kernel width and thickness) of living and archaeological specimens to provide a match for maize race. Taken into consideration with the statistical study was the sampling and reporting of measurements of extant races in archaeological reports, how well the modern maize data corresponds with the extant material, and how much change could have occurred over time. Also taken into account by the author was the natural variability in growth of plants different environments; however this did not seem to contribute significantly to the morphological measures. When changes were identified they were more supportive of genetic differences, further supporting the methodology Eubanks has developed.

The first chapter provides a concise background on botanical studies of maize and the history of its study in the Mesoamerican

and Peruvian regions. A limited glossary of terms frequently used in ceramic and botanical studies is included and will be helpful for newcomers to this literature.

A chapter is devoted to each of the two cultures, the Moche and the Zapotec, which provides a brief archaeological description of the culture, the current theories, and the known archaeobotanical maize evidence. The body of these chapters centers on the description of the vessels divided into categories determined by vessel form (bowl, stirrup-spout, olla, urn), associated iconography and the maize cob that has been identified by race. In some instances, the additional stylistic traits made provide clues to other botanical information. For example, in the Moche sample, the maize cob is frequently depicted as an anthropomorphized fanged diety *Ai-Apaec*, and smaller 'companion figures' of maize. Eubanks believes that these vessels may be displaying the interbreeding of *Tripsacum* (wild grass related to maize) and maize which is known to produce miniature ears at the base of the primary cob. At the end of the respective chapters is a photograph inventory of the Moche and Zapotec samples which is indispensable in following Eubanks' discussion of the maize traits and associated iconography. Additional information includes curation location, fabric color, dimensions and race of maize depicted. My only critique is with the publisher in the layout of this section: the data and photos are often divided between facing and following pages, disrupting the continuity of the data presented with the associated photograph.

Eubanks concludes that there was contact between the two cultures but it was probably not direct contact since there is clearly a difference in ceramic technology, even though both cultures are unique in their time period of employing mold-impressions of maize. There is clear evidence of South American races of maize (Confite Puntiaquedo/Conguil, Oke, Karapampa, and Puya) represented on Zapotec urns and a Mexican maize race (Chapalote) on Moche jars suggesting some form of interaction between the two regions.

We are lucky that Eubanks was up to the challenge proposed by her mentor Paul Mandelsdorf to follow this line of study and equip herself with the knowledge and skills needed in two disciplines—that of botany and archaeology. Her work will prove its worth in the years to come as new material becomes available through fieldwork carried out in western Mexico and northern Peru. More importantly, however, will be the material from areas of Central America and northern/northwestern South America that have thus far been little explored compared to other areas due to political unrest. Eubanks has provided the groundwork in the methodology and an initial data set that demonstrates that a pot can reveal yet one more layer of scientific information even if the botanical macro-remains may not be present.

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**Taphonomy: A Process Approach.** Ronald E. Martin. Cambridge University Press, 1999. Cambridge Paleobiology Series 4 xvi + 508 pages. ISBN 0-521-59833-8 (paperback), ISBN 0-521-59171-6 (hardback)



*Reviewed by Winifred L. Ryan, Department of Coastal and Ocean Policy, Virginia Institute of Marine Science, Gloucester Point, VA 23062*

*Taphonomy: A Process Approach* is an overarching text which considers biological, chemical and physical effects as an organism is transformed from its life to fossilization. It covers numerous environments for burial, from aquatic to terrestrial and overviews fossilization of major taxonomic groups.

Chapter 1 reviews the definition of the term taphonomy (for those in the know, it is the science of the laws of burial). Martin grounds his text in the history of paleontology, the rules of taphonomy, and models and classification of fossil assemblages.

Chapter 2 is the longest chapter of the book. In it the author covers basics of fluid and sediment movement, and preservation of the major taxonomic groups, both floral and faunal. Microfossils are given special consideration with both flora and fauna- the floral microfossils being pollen and the faunal largely being shelled aquatic fauna. Chapter 2 concludes with the methods of enumeration for taphonomic and paleontological studies, reviewing the differences between minimum number of individuals and minimum number of elements.

Chapter 3 deals with chemical alteration of fossils, particularly dissolution and mineralization of fossil materials. Carbonate dissolution and precipitation are described, as are pyritization, silicification and phosphatization. By and large this chapter deals with marine environments. Additionally, the effects of shell mineralogy, architecture, microstructure and size on preservation and dissolution are covered.

Chapter 4 focuses on bioturbation. Bioturbation in terrestrial environments and aquatic environments is covered, along with mathematical models of bioturbation. The author differentiates the types of models best applicable to small (molecular) particles, and larger (shell or bone) particles.

Chapter 5 covers time averaging of fossils, the advantages and disadvantages of time averaged assemblages, how to recognize time averaging in the record, and durations of time averaging.

Chapter 6 contains descriptions of instances of exceptional preservation. While earlier chapters dealt with why certain materials may be concentrated into an assemblage, the sites and assemblages described in this chapter are the result of special circumstances in which materials are well preserved through rapid removal from the taphonomically active zone.

Chapter 7 reviews principles of sedimentation and stratigraphy. Stratigraphic maturity, stratigraphic completeness (for both marine and terrestrial sediments), sequence stratigraphy, sampling biases of the paleontological record and methods to analyze completeness of the record are included.

Chapter 8 is the first of two chapters on megabiases in the geological record, focusing on cycles of preservation and biomineralization. These cycles are important in that paleoclimatic conditions affect both sedimentation and chemical availability, for example warmer seas affect carbonate stability.

Chapter 9 also is on megabiases in the geological record, this chapter on secular megabiases. These biases both between

and within taxon have to do with the organisms themselves in the environment of potential degradation or preservation. This chapter is focused on marine organisms.

Chapter 10 encompasses applications of taphonomy into evolutionary and ecological questions of extinction, community stasis, disturbance and alternate stable states, population dynamics and paleophysiology.

Chapter 11 contains the author's consideration of taphonomy as a historical science. It consists of a reprisal of the major themes of the book, most especially that there are numerous taphonomic pathways. The author adds some additional rules for the consideration of fossil origins and preservation, and thoughts on the study of taphonomy for both paleontology and ecological studies.

This text appears to be most useful to very advanced students of paleontology, sedimentology, stratigraphy and biogeochemistry as well as professionals in those fields. While the overview of taphonomic processes can be useful for archaeologists and paleoanthropologists, this text as a whole has somewhat less usefulness as examples are drawn from portions of the geologic record vastly predating the sections in which we work. In addition, the author neglects preservation methods important to archaeologists in that he does not review preservation in ice or preservation by dessication.

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**Theoretical and Quantitative Approaches to the Study of Mortuary Practice.** Feldore McHugh, BAR International Series 785: Oxford, 1999. xii + 364 pp., 215 tables, 3 appendices. Price: (paperback = £37). ISBN: 1-84171-005-9.

*Reviewed by Danielle A. Parks, Department of Art History and Archaeology, University of Missouri-Columbia, Columbia, MO 65211 USA.*

In this volume, Feldore McHugh delineates the state of the study of mortuary practice, and then discusses the use of different statistical techniques in the evaluation of artificial models of cemeteries. Chapters 1 through 6 examine and evaluate current trends in mortuary theory, while Chapters 7 and 8 are devoted to his assessment of the relative appropriateness of three multivariate statistical methods.

Chapter 1 introduces the subject of mortuary theory, reviewing a few of the major works. McHugh has chosen to focus on three major progenitors of the discipline, Saxe, Binford, and Tainter, and provides a useful summary and critique of their work, acknowledging the debt to these scholars. The author correctly emphasises that there is a need to allow for a wider variety in the interpretation of mortuary remains, and that there is sometimes, but not always, a direct correlation between social complexity and rank and the surviving remains. These could be a consequence of rituals not represented in the archaeological record, or as Hodder indicates, because one must allow for a greater variety of attitudes towards death within an individual society. McHugh's points regarding the values and dangers of ethnographic evidence are also well-taken. While McHugh alludes to the work of Morris and O'Shea, among others, he

really does not examine any of the more recent works. This chapter provides a valuable assessment of the seminal works of three individuals, but it would be worthwhile to devote more attention to later scholarship.

The next four chapters are devoted to four dimensions present in burial rituals: age, gender, vertical and horizontal differentiation. Traditionally, scholars have interpreted these dimensions rather simplistically, often in a presence-absence manner. McHugh explains the pitfalls implicit in such an application of mortuary theory. In Chapter 2, which addresses age, he lays out the various scenarios, differentiating between stillborn and other children who died very young; subadults; and adults. Attributes which could be linked with age must be treated with caution as they may rather indicate ethnicity, status, or wealth. Different societies placed varying stress on the value of age, a consequence of internal organisation or changing attitudes dependent on circumstance. He also stresses that there can be a difference between biological and social adulthood, and that sometimes the age of the deceased is deliberately misrepresented to confer status or another desirable attribute.

Chapter 3 concerns the gender dimension. Once again, McHugh warns against stringent application of differentiation based on presumed gender symbolism. Attributes may be only symbolic, and need not reflect contemporary male-female relations in the society itself. The constituents of grave assemblages may be affected by such variables as fashion and occupation that are indirectly dictated by gender, or by societal changes that create a faulty impression of greater or lesser disparity between the genders. Finally, the use of mortuary evidence to evaluate post-marital residence patterns, as McHugh correctly elucidates, is not valid given that there are many other factors at work which can not be eliminated.

The horizontal dimension is addressed in Chapter 4. McHugh delineates the ways in which such divisions can make themselves manifest. However, he correctly points out that it is difficult to differentiate between horizontal and vertical dimensions, or that components which may in fact have no meaning can be mistakenly assigned significance. Furthermore, many of the ways in which the horizontal dimension can be expressed are ritual or ceremonial and thus do not appear in the archaeological record.

Similar concerns affect the vertical dimension discussed in Chapter 5. The author again describes ways in which status affects burial customs, and states that similarly some of the most important manifestations occurred during ceremonies or consisted of symbols made from perishable materials. He also cautions that emotion may result in an increase in energy expenditure, which could easily be confused with markers of high status. Furthermore, there is sometimes an inverse relationship between status and energy expenditure, resulting in decreased efforts for burials of important personages.

Chapter 6 comprises an evaluation of the three most commonly employed multivariate statistical techniques, cluster analysis, principal components analysis, and correspondence analysis. This chapter, as compared to those that precede it, is rather inaccessible. The author does not clearly explain each of the techniques under discussion, and when referring to case studies, alludes to them so briefly that the examples do not

illustrate the matter at hand. McHugh does elucidate the inherent bias in selection and coding of variables for statistical analysis and the dangers of divorcing the results from theory. His discussion of cluster analysis is more comprehensible than those of the other two techniques, underlining the problems inherent to the definition of a group (where do you draw the line) and that the technique is best suited to detecting the vertical ordering of a society. He cites the dangers of small sample size and the importance of the number of variables relative to sample size for principal component analysis, but the discussion of correspondence analysis is quite thin. It is only with Chapter 7 that McHugh reaches the point of this monograph, and what he proposes to do is quite interesting. He would like to evaluate the relative effectiveness of the three statistical techniques discussed in Chapter 6, and proceeds to do so by concocting models of artificial cemeteries. He lists twenty principles for his mortuary domain, all eminently reasonable, but seemingly offered at random, based on comparative archaeological and ethnographic research. He then examines several recent burial studies that employ multivariate techniques to analyse vertical and other dimensions. On the basis of these observations, he develops a series of nine models, egalitarian and hierarchical, with degrees of variability in population and artifacts, as well as in ambiguity of artifactual association and randomness of artifactual occurrence. Sample size is also subject to variation in order to test the effectiveness of methods relative to this factor. Each model is to be analysed not only using each of the multivariate techniques, but also several variants of each technique. The following section on the objective comparison of results is somewhat abstruse and the conclusions for this chapter relatively sparse. The tables and raw data reported in Appendices 1 and 3 respectively are very interesting, but summarising graphics would be very helpful for those who do not wish to wade through the eighty-odd pages in these sections.

Chapter 8 presents the results of the analysis of each model completed with each of the three proposed statistical techniques and their subvariants, and then compares the results. These results are summarised in the chapter, and replicated in the appendices, and would, like those from Chapter 7, benefit from summary graphics. McHugh concludes that cluster analysis produces variable results, sometimes inconclusive, but at other times yielding useful directions for more intensive study. Given the ease of use of this method, he recommends that researchers begin with this technique, and adds that there is no substantial difference between its variants. Principal components and correspondence analyses proved meaningful in different ways, highlighting different aspects of the society in question, and therefore should be employed in concert and their results combined to produce the best picture possible. He further recommends the use of rotated principal components analysis over the non-rotated variety. Sample size did not appear to impact the results of any of the analyses. The very useful results from this chapter would be made more immediate to the reader had McHugh employed real examples to illustrate them in addition to his artificial models. Likewise, his conclusions to the volume would have been more effective had he elaborated on future directions and uses of his study rather than devoting so much time to reiterating the conclusions of Chapters 1-6.

Most of this volume is devoted to urging caution in the absolute application of mortuary theory, pointing out potential pitfalls to the scholar not considering variation as part of the human condition. Chapters 1 through 6 provide useful, if spotty, summaries and critiques of the state of the study, but do not offer anything new and are often repetitive and could be consolidated. McHugh pulls on many different sources, ethnographic and archaeological, Old and New World, but often in a very offhand manner. Things get interesting in Chapters 7 and 8, and the author would have been better served to elaborate on these sections and condense those that preceded them. These two chapters comprise the real contribution of this work, and should be accorded greater emphasis. The turgid prose style affected by the author presents a major problem to the reader, particularly at the beginning of the volume, which in places renders the material difficult to grasp. The tables could also be made more accessible with the addition of graphics. In short, a very interesting work that would benefit from revision, but not to be embarked upon by those uninitiated in the tenets of mortuary theory.

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**Ceramics and Community Organization among the Hohokam.** David R. Abbott, The University of Arizona Press: Tucson, 2000. xii + 280 pp., 33 figures, 22 tables, 1 appendix, index. Price: US\$40.00 (cloth). ISBN: 0-8165-1936-6.

*Reviewed by E. Christian Wells, Department of Anthropology, Arizona State University, Tempe, AZ 85287-2402 USA.*

This book presents a new and interesting geochemical perspective on ceramic exchange and economic variability among Classic period Hohokam communities of central Arizona. In conjunction with petrographic analysis, the author employs scanning electron microscopy and quantitative energy-dispersive spectroscopy to compositionally characterize ceramic clay fractions of Hohokam pottery, namely plainwares, redwares, and Salado polychromes. Based on a comprehensive multivariate statistical assessment of multiple data sets, Abbott identifies different ceramic production loci and tracks the movement of pottery within and among communities associated with different irrigation canal systems. The results of these insightful studies leads Abbott to argue that, over time, pottery exchange networks intensified, resulting in the formation of bounded supreresidential cooperatives. He proposes that the proliferation of these sets of closely cooperating residential groups indicate that crosscutting horizontal social relationships were predominant, and that supravillage cooperation was probably not dependent on vertical ties. This argument has important consequences for managerial models that have been proposed previously to explain the organization of Hohokam water management and the development of sociopolitical complexity in the Phoenix Basin. In this way, the book makes significant contributions, not only to Hohokam culture history in particular and to ceramic studies in general, but also to the growing body of research on the development of sociopolitical complexity in non-state societies.

The first two chapters serve as an introduction to the book and include details on Abbott's theoretical approach and the multidimensional framework he employs for data collection and evaluation. Although his study focuses primarily on ceramic production and distribution, he is ultimately concerned with the greater goal of elucidating how water management articulated with community structure. In this introduction he critiques the ways in which Hohokam settlement pattern data have been used to support a managerial model of hierarchical social organization. In addition, he lays out the environmental and cultural background for the study, describing the details of how canal systems are constructed and organized and how they may have affected the spatial patterning of residences.

Chapter 3 reviews current models of Hohokam social organization and points out some of the limitations and problems with these approaches. Generally, Abbott is dissatisfied with models that rely heavily on settlement pattern data alone, which, he points out, often leads researchers to conclude that spatial distance (from a core site) equals social distance. He proposes two alternatives, both of which involve nonhierarchical modular organizations. These models are evaluated in the remainder of the book using data derived from archaeological investigations carried out at Pueblo Grande and neighboring sites, the details of which are presented in Chapter 4.

Chapter 5 covers the local geology of the central Phoenix Basin and reports the results of petrographic analyses of a large and diverse sample of ceramics. Abbott finds that Hohokam potters were highly selective with respect to temper selection, preferring platy, angular sands and rock fragments over river-worn materials. Absent from this chapter is a serious consideration of why local potters preferred certain tempering agents over others. The answer to this question is important because differences in the technological properties of temper types could relate to variations in behavior rather than geography, which the author hopes to identify. Simple experimental studies that examine vessel hardness, porosity, thermal behavior, and use wear could address this issue sufficiently.

In Chapter 6, Abbott describes a method, originally reported by Ian Freestone in the early 1980s, to rapidly characterize the chemical composition of pottery using scanning electron microprobe analysis. For this technique, ceramic thick sections are imaged at a very high magnification using a scanning electron microscope. Energy-dispersive spectroscopy is used to assay very small portions of the ceramic clay matrix, several microns in diameter, while analyzing separately the elemental constituents of aplastic inclusions. The main advantage of this technique over other methods used to study chemical heterogeneity in ceramics, such as ultrasonic disaggregation or weak-acid extraction ICP-MS, is that the microprobe provides greater control over the characterization of individual clay particles. Abbott employs a series of bivariate plots to discern among reference groups, and uses a Holling's  $T^2$  statistic and univariate student's  $t$ -tests to determine the extent to which the reference groups are analytically distinct from one another. The discriminant analysis, employed to assign unknown cases to established reference groups, might have benefited from the use of a correlation matrix, which gives equal influence to all



variables (elemental concentrations) since aluminum and silicon are major elements that account for most of a sherd's chemistry and could potentially dull the effects of minor elements in the analysis.

Chapter 7 documents technological aspects of pottery production. Abbott argues convincingly that plainware and redware containers were manufactured to satisfy the same utilitarian functions, although this is a proposition that warrants further testing, not a conclusion that can be drawn from the available data. Based on his studies of exchange patterns, Abbott notes that most plainware and redware vessels at Pueblo Grande were imported to the site, suggesting that local residents may not have manufactured their own pottery. In Chapter 8, Abbott presents a model of ceramic production and exchange, focusing on the exchange values of certain pottery wares and how household inventories might reflect the social status of domestic groups.

Chapters 9 and 10 synthesize the results of the study, and evaluate the different models of Hohokam social organization presented at the beginning of the book. Briefly, Abbott finds that the data seem to support the existence of numerous horizontal and crosscutting social ties that integrated the membership of the irrigation cooperative into a single, bounded community. These relationships, he argues, are manifest in residence groups that formed supraresidential cooperatives. Chapters 11 and 12 conclude the book and offer a trial model of sociopolitical change for Hohokam society. By the end of the book, the reader (and probably the author) is left with many questions, such as, To what degree were supraresidential cooperatives active in political arenas?, and Could exchange mechanisms, such as market activities, help to explain the spatial patterning of redware pottery and exotic items?

On the technical side, the book is well organized, leading the reader through the process of investigating irrigation management, community organization, and exchange relations. The figures and tables are clear and relate well to the text, providing abundant raw and processed data for readers to evaluate on their own. Overall, this book is a rich and complex study that has the potential to reorient the analysis of Hohokam exchange networks to a completely different scale: that of the supraresidential cooperative. In doing so, it becomes clear that communities are not always spatially bounded units situated within a single settlement, suggesting that we may need to rethink some of the neo-evolutionary assumptions tied to settlement pattern studies. A growing number of important investigations are being made on this front, including research on residential microcosms and segmentary organizations, and this book contributes to these efforts in important theoretical and methodological ways.

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**Ancient Egyptian Materials and Technology.** Paul T. Nicholson and Ian Shaw, Cambridge University Press, 2000. xviii + 702 pp., 322 figures and tables, index. Price \$160.00 (hardbound). ISBN: 0-521-45257-0.

*Reviewed by Andrew Shortland, Research Laboratory for Archaeology and the History of Art, University of Oxford, UK*

This new, long awaited book aims to describe the procurement and processing of raw materials by the ancient Egyptians. As such it covers much the same area as Alfred Lucas's classic book *Ancient Egyptian Materials and Industries*, the fourth and last edition of which was revised by J.R. Harris and published in 1962. Roger Moorey has recently written a more up to date Mesopotamian equivalent, *Ancient Mesopotamian Materials and Industries* (Moorey 1994). It is therefore inevitable that the new book by Nicholson and Shaw will be compared to both these volumes. The new work aims to integrate information derived from newly developed analytical techniques and evidence from many recent excavations, much of which was not available when the 1962 edition of Lucas was published. The authors state that the new book is not intended to replace Lucas (1962) or as a revised edition to it, but they hope "that it will provide a free standing source of reference on its subject" (page 1).

Nicholson and Shaw broadly group the materials they cover into three parts: inorganic materials, organic material and food technology. These parts are then subdivided into chapters, each devoted to a different material (stone, pottery, wood, resins and so on) in much the same way as Lucas (1962) and Moorey (1994). Those familiar with both the earlier works will note that Nicholson and Shaw have considerably expanded the depth and range of materials covered, especially on the organic materials side, perhaps reflecting one of the main thrusts of modern analytical research. Hence much information is provided on oils, resins, adhesives and binders, and the residues left by brewing, balking, viniculture and general food preparation. It should be noted though, that the book is not (nor is it intended to be) a text-book on the scientific analysis of such materials. Instead it provides summaries of the methods as they are applicable to Egyptian materials and the results of their application, all in a language that is easily accessible to the non-specialist.

There are several major strengths in the new work, most especially: the inclusion of pictures and the use of specialists to write each chapter. Lucas (1962) had no illustrations or diagrams and Moorey (1994) has only 24 in the entire book. Both books would have been much assisted by the greater use of pictures. Nicholson and Shaw have realised this and it is to their credit that their new book is full of illustrations, including photographs of sites, objects, sherds and thin-sections, line drawings showing the constructions of buildings, kilns, tools and even some of the plants used for the manufacture of resins, foods, etc. Copies of relevant tomb scenes showing various processes being carried out, whether it be threshing, spinning or metal-working, are also common and particularly enlightening. The inclusion of figures also means that some of the new scientific results can be presented in graphical form, for example Nicholson and Shaw include chromatograms of different organic residues so that they can be compared and X-ray spectra of various glasses. A number of chapters, especially "Brewing and baking", make use of chaines operatoire displayed as flow-charts which make clear the various operations of these multi-stage processes. Much hard work has obviously gone into the selection of the illustrations, which are uniformly well produced and are one of the highlights of the book.

The second strength of the book, which is also a slight weakness, is that unlike the both Lucas (1962) and Moorey (1994), Nicholson and Shaw are editing this work and a different specialist in each particular area has written each individual chapter. Hence we have such renowned experts as Barry Kemp (on clay), James Harrell (stone) and Edgar Peltenburg (faience with Paul Nicholson) writing on their own areas. There is an obvious advantage in letting the experts write their own chapter; one gets information straight from the person who is in the best position to convey it. It also means that the complex terminologies used within each of the very specialised natural science subjects (from igneous petrology to organic chemistry) are accurately applied. The weakness of this approach is that each author adopts his or her own style and method of presentation and includes a slightly different range of information. Presumably despite the best efforts of the editors, some of the chapters are more “technological” than others. For example, the chapter on basketry is 14 pages long covers the materials used, the techniques and tools of manufacture and some notes on the people who were involved in basket making. A great deal of very interesting information is included about the various sorts of basket weave, their advantages and disadvantages and their classification. The following chapter dealing with textiles is over twice as long (quite reasonably given the importance of the material) and covers much the same ground, but also includes ten pages on the uses of textiles. Both are very well written and interesting, but when one reads after the other there is an obvious difference in emphasis. However, the book is designed to be used as a reference work to be “dipped into” and (apart from the book reviewers) few people are likely to read it through from cover to cover. This weakness is therefore not a serious one. Perhaps the only other slight weakness is that the book was a long time in production, and the various chapters handed in by their authors at various times during this process. This has meant that while the book was officially published in 2000, some of the chapters refer to very few papers more modern than 1996 or 1997. Therefore, certain chapters perhaps therefore do not represent the very latest research in their area, which one might otherwise expect from a 2000 publication date.

Overall, Nicholson and Shaw have produced a very useful reference tool for those involved in research in the field of Egyptian materials and technologies. When read in conjunction with Lucas (1962), it presents a very useful summary of known facts and many of the scientific techniques that can be applied. The lists of references cited are very useful, although perhaps not as complete in their coverage of earlier works as Moorey’s on Mesopotamia. The style is also more general in flavour than Moorey’s book and hence it is perhaps also more accessible to non-materials specialist, be that a student of archaeology or Egyptology, or museum curator. However, at \$160, it is unlikely to find its way onto the bookshelf of the non-specialist and this is a shame, because it is readable and covers a wide enough area to be a useful reference. One hopes that in the near future Cambridge University Press will be able to produce a cheaper paperback version and that this will enable the work to be widely read.

### References

- Lucas, A. 1962. *Ancient Egyptian Materials and Industries*. 4<sup>th</sup> edition, revised by J.R. Harris. London: Edward Arnold.  
 Moorey, P.R.S. 1994. *Ancient Mesopotamian Materials and Industries*. Oxford: Clarendon Press.

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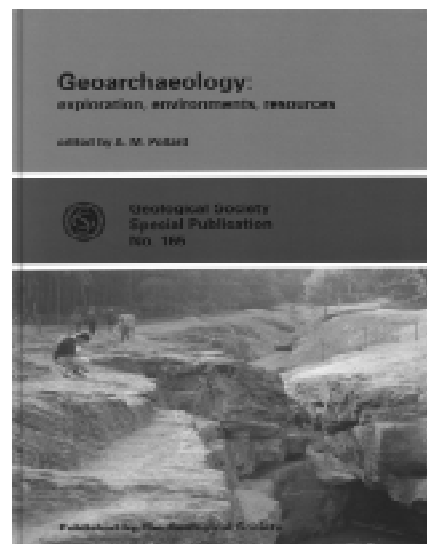
## Books Received

- Emery, A. 2000. *Greater Medieval Houses of England and Wales, 1300-1500: Volume 2: East Anglia, Central England, and Wales*. Cambridge University Press. \$195 (cloth). ISBN 0-521-58131-1.  
 Gamble, C. 1999. *The Palaeolithic Societies of Europe*. Cambridge University Press. Cloth (\$85.00, ISBN 0-521-65105-0); paper (\$37.95, ISBN 0-521-65872-1).  
 Gould, R.A. 2000. *Archaeology and the Social History of Ships*. Cambridge University Press. \$74.95 (cloth: ISBN 0-521-56103-5); \$29.95 (paper: ISBN 0-521-56789-0).  
 Harding, A.F. 2000. *European Societies in the Bronze Age*. Cambridge University Press. \$79.95 (cloth: ISBN 0-521-36477-9); \$34.95 (paper: ISBN 0-521-36729-8).
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**Geoarchaeology: exploration, environments, resources.**  
 Edited by A. M. Pollard. Geological Society Special Publication No. 165. SBN: 1-86239-053-3. 180 pages, hardback, October 1999. Price: £65.00/US\$108.00. Offer price: £30.00 / US\$50.00.



Geology and archaeology have a long history of fruitful collaboration stretching back to the early 19th century. Geoarchaeology - the application of the geosciences to solve research problems in archaeology - has now emerged as a recognized sub-discipline of archaeology, especially in the United States. Traditionally, the methods used include geomorphology, sedimentology, pedology and stratigraphy, reflecting the fact that most archaeological evidence is recovered from the sedimentary environment. As reflected in the sub-title, this volume embraces a broader definition, including geophysics and geochemistry. Geophysical techniques, both terrestrial and remote, are now used routinely to locate and horizontally map buried features of archaeological interest. New developments include the use of georadar and other methods of giving vertical information. Geochemistry has long been used to give information about the exploitation, trade and exchange of mineral resources and finished products such as metals and pottery. Refinements, such as the use of isotopic measurements to define not only exploitation but also production techniques, are increasingly being applied. Perhaps most significantly of all, geoarchaeology can contribute to an understanding of the dynamic relationship between human society and the environment in that most significant (if brief) period of geological time - that in which human activity has dramatically modified the natural world. The papers presented here exemplify the many and varied ways in which geology and archaeology can combine to the mutual benefit of both.

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#### *Contents*

Geoarchaeology: an introduction • Exploration: Medieval iron and lead smelting works: a geophysical comparison • Euler deconvolution methods used to determine the depth to archaeological features • The application of microgravity in industrial archaeology: an example from the Williamson tunnels, Edge Hill, Liverpool • Environments: The Makapansgat Australopithecine site from a speleological perspective • Testing the potential of soil-stratigraphic palynology in podsols • Tracing the record of early alluvial tin mining on Dartmoor, UK • Resources: Provenancing iron ore from the Bristol Channel Orefield: the cargo of the Medieval Magor Pill Boat • Geochemistry of ballast granites from Brouage and La Rochelle, France: evidence for medieval to post-medieval trade with Falmouth, Cornwall, and Donegal, Ireland • Geochemistry and the early alum industry • Zinc isotope fractionation in liquid brass (Cu-Zn) alloy: potential environmental and archaeological applications • The determination of bloomery furnace mass

balance and efficiency • Geoarchaeological research into the historical relics of the south Urals: problems, results, prospects • Index.

**The Archaeology of Geological Catastrophes.** Edited by: W. J. McGuire (University College London, UK), D. R. Griffiths (University College London, UK), P. L. Hancock (University of Bristol, UK) and I. Stewart (Brunel University, UK). Geological Society Special Publication no. 171. April 2000. ISBN: 1-86239-062-2. 440 pp. List price: £79.00 / US\$132.00 (hardback). Offer price: £35.00 / US\$58.00.

Archaeology is playing an increasingly important role by unravelling the details of geological catastrophes during the past few millennia. The collection of papers that make up this volume address established and innovative archaeological methods and techniques, and their application to examining the impacts of earthquakes and volcanic eruptions.

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Readership: Academic researchers and educators in Archaeology, Palaeoseismology and Volcanology. Postgraduates in the aforementioned fields.

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Alaska: What can and cannot be done with Tephra deposits · Endemic stress, farming communities and the influence of Icelandic volcanic eruptions in the Scottish Highlands · Comparison and cross-checking of historic, archaeological and geological evidence for the location and type of historical and sub-historical eruptions of multiple-vent oceanic island volcanoes · ‘A fire spitting volcano in our dear Germany’: documentary evidence for a low-intensity volcanic eruption of the Gleichberg in 1783? · Volcanic soils: their nature and significance for archaeology · The use of volcanicalstic material in Roman hydraulic concretes: a brief review · Olmec stone sculpture: selection criteria for basalt · Seismic and volcano hazards affecting the vulnerability of the Sana’a area of Yemen · Archaeological, geomorphological and geological evidence for a major earthquake at Sagalassos (SW Turkey) around the middle of the seventh century AD · Fault pattern of Nisyros Island volcano (Aegean Sea, Greece): structural, coastal and archaeological evidence · The geological origins of the Oracle at Delphi, Greece. Index

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## Meetings Calendar

*Susan Mulholland, Associate Editor*

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

### 2000

- \*Oct. 3-7. Rassegna Internazionale del Cinema Archeologico. Rovereto, Italy. “The Origin and Development of European Culture and Civilization.” Dario Di Blasi, Director, Museo Civico, Largo S. Caterina 43, 38068 Rovereto (TN), Italy; tel: 39-464-439-055; fax: 39-464-439-487.
- \*Nov. 8-12. 33rd Annual Chacmool Conference. Calgary, Alberta, Canada. “Art for Archaeology’s Sake: Material Culture and Style Across the Disciplines.” Marc Zender, Chacmool 2000 Abstracts Committee, Dept. Of Archaeology, University of Calgary, Calgary AB T2N 1N4, Canada; fax: 403-282-9567.
- \*Nov. 9-12. Joint Midwest Archaeological and Plains Anthropological Conference. St. Paul, Minnesota, USA. Mark Dudzik, Office of the State Archaeologist; tel: 612-725-2411.
- \*Nov. 9-18. Geological Society of America Annual Meeting. Reno, Nevada, USA. <http://www.geosociety.org/meetings/2000/htm>.
  - The Employment of Geological Techniques for Archaeological Provenance Studies; Philip La Porta, City University of New York.
  - Colluvium: Recent Advances in Applying Geomorphology, Stratigraphy, and Sedimentology to Interpret Late Cenozoic Slope Processes; J. Steven Kite, [jkite@wvu.edu](mailto:jkite@wvu.edu).
  - Geoarchaeology of Colluvial Landscapes; David Cremeens, [d.cremeens@gaiconsultants.com](mailto:d.cremeens@gaiconsultants.com).
- Nov. 15-18. American Schools of Oriental Research, Annual Meeting. Nashville, Tennessee, USA. Section: New Discoveries from Materials Science in the Archaeology of the Near East. Elizabeth Friedman, 1369 E. Hyde Park Blvd., Apt. 1001, Chicago, Illinois, 60615, USA; tel: 773-324-4813; email: [esf1@midway.uchicago.edu](mailto:esf1@midway.uchicago.edu).
- \*Nov. 15-19. 99th Annual Meeting of the American Anthropological Association. San Francisco, California, USA. “The Public Face of Archaeology.” AAA Meetings, 4350 N. Fairfax Dr., Suite 640, Arlington Va 22203, USA; tel: 703-528-1902 ext. 2; email: [jmeier@aaanet.org](mailto:jmeier@aaanet.org).

### 2001

- Feb. 5-9. Australasian Archaeometry Conference. Auckland, New Zealand. Peter Sheppard, Dept. of Anthropology, University of Auckland, Private Bas 92019, Auckland, New Zealand; tel: 64-9-373-7599 x8572; email [p.sheppard@auckland.ac.nz](mailto:p.sheppard@auckland.ac.nz); web: [http://car.ant.auckland.ac.nz/archconf/arch\\_feedback.html](http://car.ant.auckland.ac.nz/archconf/arch_feedback.html).
- \*April 18-22. 66th Annual Meeting of Society for American Archaeology. New Orleans, Louisiana, USA. SAA headquarters, 900 Second St. NE #12, Washington DC 20002, USA; tel: 202-789-8200; fax: 202-789-0284; email: [meetings@saa.org](mailto:meetings@saa.org); web: [www.saa.org](http://www.saa.org).
- \*April 25-29. CAA2001. Computer Applications in Archaeology. Visby Conference. CAA 2001 will be held in Visby on the

island of Gotland, Sweden. The conference will take place at the Gotland University College and will consist of three parallel sessions of lectures, as well as posters and demonstrations. The aim is to bring together archaeologists, anthropologists, osteologists, environmentalists, cultural heritage managers, historians, mathematicians, numismatists, human geographers, computer scientists and experts from other disciplines related to archaeological research and methodology, and to encourage communication between these disciplines, provide a survey of present work in the field and to stimulate discussion and future progress. The CAA2001 Proceedings will be published by Archaeopress in BAR International Series. Lecture slots of 30 or 15 minutes respectively can be chosen, and main themes of the CAA 2001 will be: GIS Applications; CAD Applications; GPS; Survey and Mapping; Database Applications; Computer Applications in Osteology (human and animal); Statistics and Quantitative Methods; Virtual Reality; Cultural Heritage Management; Archaeometry; Digital Image Processing; Internet Applications. Three parallel sessions of 30 and 15 minute lectures will take place Thursday - Saturday, April 26-28, and the conference dinner, arranged as a medieval banquet, will be held on Saturday evening. A full-day excursion around the island of Gotland will be arranged on Sunday, April 29. You can register for the conference at the CAA homepage (<http://caa.hgo.se/>). All registration information, including call for papers form and mailing list, are also available there. Please note that you have to register your email address at the homepage to receive continuous information on the CAA 2001 conference. Welcome to Gotland! Organizer: Professor Göran Burenhult, Gotland University College, Cramérgatan 3, 621 57 Visby, Sweden; email: [caa@hgo.se](mailto:caa@hgo.se)

\*June 24-28. Earth System Processes: Geological Society of America and Geological Society of London. Edinburgh, Scotland. Ian Dalziel, University of Texas at Austin. Web: [www.geosociety.org/meetings/edinburgh/index.htm](http://www.geosociety.org/meetings/edinburgh/index.htm).

\*Aug. 26-30. 10th Archaeological Chemistry Symposium at the American Chemical Society meeting. Chicago, Illinois, USA. Kathryn A. Jakes, 1787 Neil Avenue, Columbus OH, USA 43210; tel: 614-292-5518; email: [Jakes.1@osu.edu](mailto:Jakes.1@osu.edu).

Sept. 18-22. PAGES PEPIII Conference. Aix-en-Provence, France. Catherine Stickley, Environmental Change Research Centre, University College London, 26 Bedford Way, London, WC1H 0AP, UK; tel: 44-0-20-7679-5562; fax: 44-0-20-7387-7565; email: [c.stickley@ucl.ac.uk](mailto:c.stickley@ucl.ac.uk); web: [www.geog.ucl.ac.uk/ecrc/pep3](http://www.geog.ucl.ac.uk/ecrc/pep3).

\*Sept. 19-22. EMAC '01. 6th European Meeting on Ancient Ceramics (Ceramics in the Society). Fribourg (Switzerland). Organised by Prof. Dr. M. Maggetti and Dr. V. Serneels, Institute of Mineralogy and Petrology, University, P'rolles, CH-1700 Fribourg (Switzerland); tel ++ 41-26- 300 8920; fax: ++41-26-300 9765; email: [marino.maggetti@unifr.ch](mailto:marino.maggetti@unifr.ch), [vincent.serneels@unifr.ch](mailto:vincent.serneels@unifr.ch) <http://www.unifr.ch/mineral>

\*late Sept. A Fiftieth Anniversary Symposium on Scientific Research in the Field of Asian Art. In 1951, Rutherford John Gettens came to the Freer Gallery of Art at the Smithsonian Institution and founded the Technical Laboratory. Using scientific methods for the study of works of art, Mr. Gettens and his colleagues advanced our understanding in a number of areas. The casting methods of the ancient Chinese and the

physical nature of paintings (and pigments in particular) were subjects of notable work in the past, and today they continue to be active areas of research at the Freer Gallery. To mark the occasion of the fiftieth anniversary of scientific research at the Freer Gallery of Art, the Department of Conservation and Scientific Research will hold a symposium in late September 2001. The theme of the program will be technical studies of Asian art. Presentations on recent scientific research on any type of art objects from Asian cultures will be considered. *Call for Papers:* Those who are interested in giving a presentation are invited to submit an abstract for consideration. Funding to offset the speakers' travel expenses will be available. Speakers should plan on presentations of twenty-five minutes in length. The language of the symposium is English, although translation of presentations in other languages may be possible. Abstracts should be approximately 200 words in length. Submissions should be sent by mail or email to the addresses given below. The deadline for submissions is December 31, 2000, and notification of acceptance will be made by January 31, 2001. Publication of the papers following the symposium is planned. *Registration:* For those interested in attending the symposium, there will be no conference fee but registration will be necessary. A preliminary schedule for the symposium will be announced in March 2001. To request further information or a registration form, use either of the addresses given below. Mail: Forbes Symposium 2001, DCSR, Freer Gallery of Art/Arthur M. Sackler Gallery, Smithsonian Institution, Washington, DC 20560; email [dcsr@asia.si.edu](mailto:dcsr@asia.si.edu). *Important Dates:* December 31, 2000: Submission of abstracts for papers; January 31, 2001: Notification of acceptance of paper; March 1, 2001: Preliminary schedule of papers will be announced; August 31, 2001: Deadline for registration. Support for the symposium is provided by the Edward W. Forbes Fund.

## 2002

\*Aug. 14-21. 17th World Congress of Soil Science, Bangkok Thailand. Arid and Semi-Arid Soils: Records of Past Climates, Carbon Sequestration, Genesis and Management. The main focal points of this symposium are to increase understanding of the genesis of arid and semi-arid soils (especially the formation of calcic, gypsic, and salic horizons); their use in paleoclimatic reconstructions and archaeological interpretations; find solutions to management problems; and to better understand their role in the carbon cycle. It is the aim of this symposium to bring together soil scientists, geologists, and archaeologists to discuss these issues. The papers are expected to deal with both the state of art (review) and new scientific results. The papers are expected to be published in a scientific book. Key words: Genesis, formation of calcic gypsic and salic horizons, soil management, archaeology, carbon cycle (sequestration), paleoclimate. Convenor: Dr. Brenda J. Buck; University of Nevada Las Vegas, Department of Geoscience, 4505 Maryland Parkway, Las Vegas NV 89154; tel 702-895-1694; email [buckb@nevada.edu](mailto:buckb@nevada.edu). Important Deadlines: receipt of all one-page summaries (April 30, 2001); receipt of selected papers (December 31, 2001); receipt of payment for registration (December 31, 2001). For more information about the World Congress see: <http://www.17wcsc.ku.ac.th/>

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