SAS Bulletin

Society for Archaeological Sciences

Volume 17 Number 4 Oct.–Dec. 1994

SAS News

News of Archaeometallurgy

Meetings and Courses

A first call for papers has been issued by the Supreme Council of Antiquities for an International Conference on Ancient Mining, Metallurgy, and Conservation of Metallic Artifacts to be held this April 10-12 in Cairo. For more information fax Dr. Kamal Barakat, Administrative Organizer, Egyptian Museum, Tahrir Square, Cairo, Egypt, at 20-2-775133. Please include your fax number for a reply.

The Department d´ Archéologie et d´ Histoire de l´Art (DAHA) of the Université de Poitiers has announced a Colloque on Les Métaux dans l´ antiquité travail et conservation (500 av. J. C.- 500 ap. J. C.) to be held 28-30 September 1995. For more information write Gérard Nicolini or Nadine Dieudonné-Glad, DAHA, Colloque "Les Métaux dans l´antiquité," Université de Poitiers, 8 rue Descartes, 86022 Poitiers Cedex, France, telephone 33 49 41 37 71 poste 346, fax 33 49 41 84 31.

The 5th biennial Archaeological Science Conference in England will be held 4-6 July 1995 at the University of Liverpool. Conference fees, including abstracts, will be about £40, and bed and breakfast £18 per night. The proceedings will be refereed and will be available early in 1996. For more information write the Conference Organiser, SACOS, University of Liverpool, Hartley Building, Brownlow Street, Liverpool L69 3BX, England.

James Thorburn is offering several mining study tours, including one to Río Tinto and the Iberian pyrite belt for 7 nights and 8 days in late April. This tour will also visit the Portuguese section of the pyrite belt. Another tour, in northern Spain in June, will include the iron mines near Bilboa, the Asturias mining field, the Roman gold mines at Las Medulas, and other industrial archaeological sites in

Archaeometallurgy (continued on p. 13)

Membership Forms

Included as part of this issue of the *Bulletin* are two copies of the current SAS membership form. These have not been paginated, so removal of them from the center of the *Bulletin* will in no way damage the integrity of the publication. It's a little late for the holiday season, but nonetheless you are urged to do the following:

1) detach these two pages from the *Bulletin*
2) post one in a prominent location
3) give the other to a colleague or a student who might be interested in joining the SAS
4) convince that person of the benefits of SAS membership

In This Issue

Laboratory Profile

Archaeological and Historical Textiles Research Program
Ohio State University

The Archaeological and Historic Textiles Research Program at The Ohio State University has as its focus the characterization of archaeological textiles and the investigation of the role that textiles played in prehistoric societies. A unique feature of the Research Program is the integration of textile science and history with archaeology to reconstruct evidence of past behavior associated with cultural groups. Fragments of textiles are examined as material entities and as evidence of human manipulation of the environment to achieve a desired product. In characterizing the textile evidence, the fibers are identified, if possible, the chemical and physical molecular and macromolecular compositions are determined, and the gross morphology is observed. Yarn and fabric structures also are characterized, and yarn morphology and interworking techniques are identified. In inferring textile utilization, the data derived from the chemical and physical studies are used to derive information about the growth environment, use, and processing techniques of raw materials including both fibers and dyes, the technology and production of yarns and fabrics, and the utilization and function of the textiles within a cultural context. Techniques of study include optical microscopy and macroscopy, scanning electron microscopy, x–ray microanalysis, infrared and Raman microspectroscopy, x–ray diffraction and experimental reproduction at the yarn and fabric levels.

Research conducted within the Program has included the study of such forms of textile evidence as partially mineralized textiles, pseudomorphs after textiles, and carbonized fragments. Other associated materials such as soil and copper artifacts have been studied since they provide archaeological contextual information. Other forms of evidence such as copper and shell engravings, wall reliefs, and pottery are used to establish the cultural context. A wide variety of geographical locations and periods of history are represented in the materials studied in the Program. For example, textiles made of plant and animal fibers have been examined from Hopewell and Mississippian sites in eastern North America. Textiles fabricated by twining fine yarns made from fibers indicate a knowledge of the fine fiber-producing plants in the environment and the types of processing associated with them (e.g. Sibley and Jakes 1986; Sibley et al. 1992). Intricately twined textiles represent further mastery of technology (Sibley et al. 1991). Dyes of the *Galium* genera of plants have been identified as well (Sibley and Jakes 1994).

Pseudomorphs after textiles embedded in the corrosion of Shang period (1300 B.C.) bronze weapons reveal mineralized silk fibers in yarns producing ribbed weaves with occasional floats, thus confirming the use of silk in textiles when no fabrics survive from the period (Jakes and Sibley 1985; Jakes and Howard 1986; Sibley et al. 1989). Late Antique and Early Medieval Egyptian textiles composed of flax and wool in tapestry-woven patterns display a mastery of techniques by weavers and considerable variation in themes and motifs. Dating by tandem accelerator mass spectrometry (TAMS) has led to the identification of calibrated dates for these textiles and provides a basis for chronology (Sibley 1983). Hair fiber textiles from the Paracas Necropolis have been shown to have been dyed with *Relbunium* genera of plants available in the environment, not imported cochineal (Jakes et al. 1990; Jakes 1991). The Paracas Necropolis peoples employed dye readily available in the Andes to color their textiles. There is no evidence of trade in the textiles studied.

Textiles recovered from an historic (1857) shipwreck have served both as evidence of marine degradation of textile fibers and as evidence for the style and function of clothing worn during the mid-nineteenth century. The fibers and fabrics display patterns of staining and deterioration due in part to anaerobic microbial degradation (Jakes and Mitchell 1992; Jakes and Wang 1993). The presence of tin in certain silk fibers raises questions of the use of tin weighting agents or tin mordants in the coloration of the fibers.

Research conducted within the Program also includes degradation studies to better understand the mechanisms of degradation and studies to determine appropriate conservation treatments for the fragile materials. Comparative collections of standard materials have been accumulated, including the Comparative Plant Fiber Collection which is

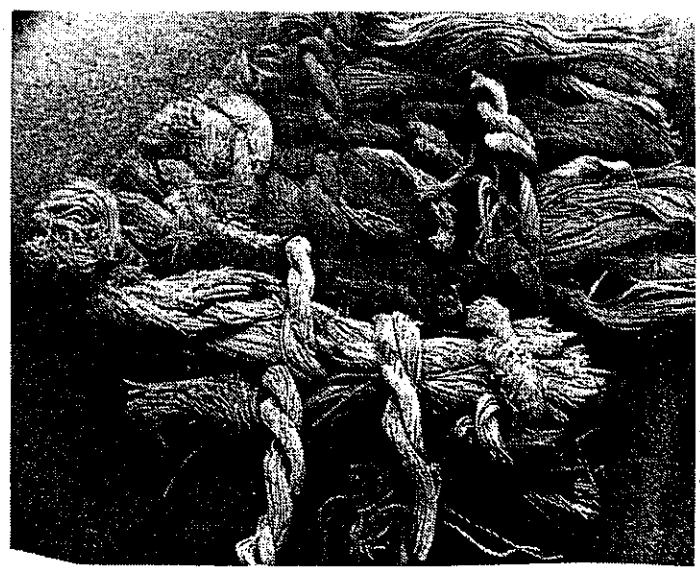

Figure 1. Spaced interlace twined textile fragment from Etowah Mound C, Georgia, ca. A.D. 1200.

comprised of over 700 fibers products yielded by over 30 genera and species of plant materials (Jakes et al. 1993; Jakes et al. 1994). Supported by the National Science Foundation, this collection provides a means to categorize the types of plant fibers employed in prehistoric native American textiles based on the assessment of multiple attributes gleaned through chemical and physical analysis. This work aids in the identification of fibers used in textiles and in assessing the history of the material. The Comparative Plant Fiber Collection continues to expand as new plant fibers and dye plants are added. Another comparative study, which is in progress, entails the placement of contemporary textiles on site in the deep ocean (Wang and Jakes, accepted for publication). Periodic recovery of groups of these textiles will form the basis for understanding the degradation of textiles in the deep ocean environment.

Leaders of the Research Program are K. A. Jakes, a polymer chemist, and L. R. Sibley, an archaeological textile historian, who have combined their expertise for a number of years to provide a unique approach to the study of archaeological and historic textile materials. Both are members of the Department of Textiles and Clothing in the College of Human Ecology. Collaboration with other University faculty and with archaeological research companies outside the university enhances the scope of the Research Program. These members of the Research Program include R.W. Yerkes and K. Gremillion, of the Department of Anthropology, and D.W. Foreman of the Departments of Oral Biology and Geological Sciences, and A. Ericksen of Archaeological Data Services, Columbus, Ohio. Collaboration also extends the laboratory facilities available for the research program. The Materials Analysis Laboratory of the Department of Textiles and Clothing houses photomicrographic equipment as well as numerous instruments for evaluating the performance of textiles. The Laboratory also is the site of the Comparative Plant Fiber Collection. In addition to the facilities of the Materials Analysis Laboratory, the Archaeological and Historic Textiles Program is linked to the Scanning Electron Microscopy Laboratory in the Department of Geological Sciences, the X-ray Diffraction Laboratory in the Department of Agronomy, and the Shared Analytical Instrumentation Laboratory of the Department of Chemistry.

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Contributed by K.A. Jakes and L.R. Sibley, Department of Textiles and Clothing, Ohio State University, 1787 Neil Avenue, Columbus, OH 43210–1295, USA □

Symposium Report

Geophysics and Archaeology

American Geophysical Union, Baltimore, 23-27 May 1994

Two sessions on Geophysics and Archaeology were held during the annual Spring Meeting of the American Geophysical Union in Baltimore, May 23-27, 1994. Both the morning poster session and afternoon session of oral presentations were organized by Rob Sternberg, Department of Geosciences, Franklin & Marshall College, and Brooks Ellwood, Department of Geology, University of Texas at Arlington. To the best of my knowledge, this was the first time that archaeologically-oriented sessions were held at an AGU meeting. The sessions were co-sponsored by two sections of the AGU: Geomagnetism & Paleomagnetism, and Seismology. With competition from many concurrent sessions, attendance was moderate, with approximately 35 in the audience during most of the oral presentations. Nonetheless, it was exciting to introduce a largely new audience to the field of archaeometry.

Several themes were represented. Archaeomagnetism was the dominant theme, as a field usually covered by the GP section of AGU. Other topics represented were electrical and magnetic prospecting, archaeoseismology, and radiocarbon geophysics and paleoclimate.

Archaeomagnetism is one of the fields where the interaction between a natural science and archaeology has been mutually beneficial, rather than one primarily serving the needs of the other. Geophysically-oriented archaeomagnetism uses dated archaeological materials to delineate the secular variation of magnetic field changes, while chronometric archaeomagnetism uses these master curves to infer dates for other features. The archaeomagnetic papers examined progress in paleointensity (Pesonen; Cui; Shaw, Kovacheva [only first authors will be listed in the text; the full author list is given below]) and archaeomagnetic direction studies (Gose; Marion; Batt).

Most archaeomagnetists regard the paleointensity experiment as too laborious to make it attractive as a routine dating method. Nonetheless, Kovacheva normally determines paleointensities as well as directions for all archaeomagnetic features, and has compiled the longest quasi-continuous archaeomagnetic records in the world. The use of intensities can resolve some of the multiple-dating possibilities that invariably arise in directional dating. Shaw discussed the more efficient paleointensity method that he has developed, and noted one of the more interesting applications of archaeointensity dating to the unique suite of Glozel ceramics, effectively using this method for authenticity testing. Cui's paper (given by Verosub) is hopefully a harbinger of things to come, with relatively straightforward rock magnetic tests used to preselect reliable samples for the more involved paleointensity experiment. Pesonen's paper highlighted the ultimate geophysical goal of such studies, the modeling of geomagnetic field behavior. It also showed how the acquisition of good data from key geographic areas is important for the mapping of regional geomagnetic behavior.

The three papers dealing with archaeomagnetic directions each had something new to offer. Marion's paper (given by Sternberg) included archaeomagnetic features that were probably burned when the Babylonians under Nebuchadnezzar destroyed the city of Ashkelon in 604 B.C., thus giving a 2500-year-old archaeomagnetic direction, known to the year. This paper also showed how aberrant directions can be used to infer site formation processes, such as re-use of hearth fragments or mechanical disturbance since firing. Gose's paper (given by Takac) also explored the topic of site formation processes, which I think will become an increasingly intriguing aspect of archaeomagnetism for archaeologists. Thermal demagnetization of burned rocks can be used to infer firing temperature, and whether the rocks have been found in situ or were moved since firing. Batt discussed the paleomagnetic study of archaeological sediments; the addition of archaeomagnetic materials from these different archaeological contexts will further extend the scope of the archaeomagnetic method. Sediments are potentially useful not only for dates, but also for consideration of the original depositional environment.

Geophysical prospecting, at least for economic and cultural resources, is not a particularly common topic at AGU meetings, although it represents the bulk of presentations at the annual meeting of the Society for Exploration Geophysicists. The SEG had two symposia on achaeogeophysical (sorry, I like that word, even though it is a bit ghastly) prospecting at the 1984 and 1989 annual meetings. The talks given here covered what have been until now the two most common methods of archaeogeophysical prospecting—magnetics (Nami; Clark; Dalan; Ellwood; Takac) and electrical resistivity (Clark; Harrold).

Nami's paper identified the geologic source of obsidian artifacts by matching magnetic characteristics with obsidian rocks of potential source areas, similar to the chemical "fingerprinting" that has been used for obsidian and other types of artifacts. Some of the artifacts with different magnetic properties must have been derived from a different, still unidentified source. This is not really prospecting in the conventional sense, but it does use the property of magnetic susceptibility as well as remanence. Magnetic anomalies can likewise be due to either susceptibility contrasts or artifacts carrying a remanence. I also identify Nami's paper with this prospecting group because it serves to locate an object in "magnetic space" rather than in "magnetic time." Ellwood's paper discussed the use of magnetic susceptibility as an environmental

indicator. Magnetic minerals and their susceptibilities will alter due to climate, pedogenic processes, weathering, and firing. Hence, elevated magnetic susceptibility in an archaeological stratigraphy can suggest fire-enhanced susceptibility within occupation levels; regional correlations of susceptibility patterns, such as in the Chinese loess sequences, can be associated with climatic change. Takac's paper pursued this theme also; magnetic studies combined with soil, micromorphological (thin-section) and geochemical analyses may facilitate the deconvolution of pedogenic and anthropomorphic effects on magnetic susceptibility.

Clark's paper presented an overview of magnetic and electrical prospecting. Development of computers, software, and magnetometers, as well as land-use planning requirements for assessment of cultural resources, have all led to an increase in the archaeogeophysical data that have been collected. The view from Britain must appear somewhat different from that in the U.S.; funding opportunities and acceptance of archaeometric research of all kinds seem more positive in the U.K. Dalan's paper (given by Banerjee) combined the micromagnetic approach emphasized in the papers of Ellwood and Takac with the traditional macro approach of electromagnetic/magnetic prospecting in order to better delineate natural and cultural features at Cahokia Mounds. The combination of survey data with a more careful analysis of the causative physical properties of the underlying materials is a model for future studies.

Two other invited papers were among the most interesting. Amos Nur discussed the types of evidence for earthquake damage at archaeological sites. The recognition of such is, of course, critical for proper archaeological interpretation; one of the quakes mentioned by Nur, which destroyed the site of Beit Shean in A.D. 79, sealed and provided a terminal date for several of the archaeomagnetic features I have measured from that site. Unfortunately, the utility of the archaeoseismic data for earthquake forecasting has been disappointing so far. I can recommend the video that Nur has made on the general topic of his presentation, "The Walls Came Tumbling Down: Earthquakes in the Holy Land."

Paul Damon's research on radiocarbon geophysics unifies several of the themes in archaeological science. Radiocarbon dating itself is the most significant chronometric dating method in archaeology. Atmospheric radiocarbon concentration fluctuations are due to magnetic field changes that can be investigated with archaeomagnetism. (My research assistantship with Paul as a beginning graduate student is what made me into the archaeomagnetist I am today!) Shorter term ^{14}C fluctuations are due to solar heliomagnetic effects, which Damon argued correlate with, and cause, climatic changes, which have in turn played a central role in the development of human culture.

Abstracts for these presentations are published in *EOS, Transactions, American Geophysical Union*, 75, 16 (supplement), 4/19/94, pp. 128-129, 132-133.

As an organizer, I was disappointed that five contributors of accepted abstracts did not show up at the meeting, and four of these did not bother to notify me in advance that they would not be coming. Four of these no-shows were not members or regular attendees of AGU meetings. Next time, I'll be more reluctant to encourage the participation of "outsiders."

List of Presentations

W.A. Gose, M.B. Collins, P. Takac and J. Guy (all at University of Texas, Austin). Paleomagnetic studies of prehistoric burned-rock features

H.G. Nami (Smithsonian Institution) and A.E. Rapalini (Ciudad Universitaria, Buenos Aires). Magnetic sourcing of obsidians in southernmost South America: preliminary results

E.M. Marion, R.S. Sternberg (both at Franklin & Marshall College) and E.H.E. Lass (Ashkelon Excavations, Israel). Archaeomagnetic results from the Iron Age and early Persian Period at Tel Ashkelon, Israel

L.J. Pesonen, M. Leino (both at Geological Survey of Finland) and H. Nevanlinna (Finnish Meteorological Institute). Archaeomagnetic intensity in Finland during the last 5500 years—Evidences for a latitude dependent non-dipole at ~500 AD

Yulong Cui, Kenneth L. Verosub, Andrew P. Roberts (all at University of California, Davis) and Mary Kovacheva (Bulgarian Academy of Science). Rock magnetic studies of hearth samples from Bulgaria; implications for selection of samples for paleointensity determinations

Francis B. Harrold, Brooks B. Ellwood and Robert L. Darwin (all at University of Texas, Arlington. Electrical resistivity measurements in geoarchaeological investigations

Amos Nur (Stanford University). Earthquakes and archaeology [invited]

Paul Damon (University of Arizona). Radiocarbon geophysics and archaeology [invited]

J. Shaw (University of Liverpool). Past, present and future of archaeointensity dating [invited]

Mary Kovacheva (Bulgarian Academy of Science). Bulgarian archaeomagnetic results for the last 8000 years [invited]

C.M. Batt (University of Bradford). Archaeomagnetic studies of archaeological sediments

A.J. Clark (Bartington Instruments). Archaeological geophysics—the view from Britain [invited]

R.A. Dalan (Southern Illinois University, Edwardsville) and S.K. Banerjee (University of Minnesota). Exploration geophysics and rock magnetic techniques as aids in understanding cultural landscape creation

Brooks B. Ellwood (University of Texas, Arlington). Interpretation of magnetic susceptibility measurements: examples from archaeological sites in Europe and the United States

P.R. Takac, W.A. Gose, P. Goldberg and M.B. Collins (all at University of Texas, Austin). Magnetic susceptibility and microstratigraphic studies in archeological contexts

Contributed by Rob Sternberg (address on back page)

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Symposium Report

AEA Annual Conference: Seasonality

Zwartsluis, The Netherlands, 21-24 September 1994

The Association of Environmental Archaeology (AEA) was formed in Britain in 1979 as a forum to discuss issues in environmental archaeology. Twenty-five years later, The Institute of Pre- and Protohistory (IPP), University of Amsterdam, hosted the Autumn conference with attendance of members from at least 12 different countries. The theme of the conference was seasonality.

A number of different techniques were used to identify seasonality—archaeozoology (bone & insects) and archaeobotany (plant remains and pollen), as well as ethnographic and historical studies. These techniques were applied to sites or cultures from areas as diverse as South Africa, the Mediterranean and Canada, but most were in northwest Europe.

The first day of the conference was devoted to bone remains and their application to seasonality. The second day covered a wider range of techniques—ethnographic work, archaeobotany and archaeozoology. The level of all the papers was excellent. Rather than try to review every paper given, I have chosen to discuss a few which epitomized the general discussion and trends of the conference. Four papers best encapsulated the general issues involved when addressing seasonality.

Terry O'Connor (University of Bradford, England) opened the conference by discussing the identification of seasonal culling in sheep and lambs. Noting both the historical evidence for culling as well as the aging evidence from teeth, O'Connor attempted to address the possibilities and limitations of the identification of seasonality. He noted that amongst Classical authors, apparently only Columella (see K.D. White, 1970, *Roman Farming*, p. 303) discusses culling. This source suggests that culling was part of a milk regime and done for economic profit rather than a lack of winter fodder—bringing lambs to market before their first winter when they are at their best.

He also pointed out that identifying an exact season of death is difficult since the range of time for birth is quite wide (most likely March to April, possibly even May). There is also the possibility that ancient breeds could lamb in the autumn. The possible timespan of birth thus places the time of culling within two possible seasons. Nevertheless, by applying age of death data to a seasonal timescale, O'Connor was able to show that it was likely most of the sheep were culled as lambs at approximately 5-6 months and the possibility of a first autumn cull was also suggested.

Another paper approached seasonality from a purely historical point of view. Finbar McCormick (Queens University, Belfast, N. Ireland) used extremely detailed kitchen records from the estate of Och ter Tyre, Scotland, over the years 1737-1738. He was able to identify a clear pattern of food use. Moreover, he could show how the laws regulating the food market in 12th century Edinburgh were tied into the seasonality of food supply. For instance, there was a flesh trade in wild birds from October to February which permitted exploitation during the migration season, but protected nesting birds in the spring. The Laird at Och ter Tyre, however, was able to avoid much of the law by reason of his wealth, access to his own herds and hunting lands, as well as gift exchange with neighbours.

Although the records only covered two years, McCormick was able to identify some seasonality within the diet. More importantly, he concluded that seasonality can be more accurately identified in the urban rather than the rural context.

One of the clearest presentations was given by Julie Hamilton (Oxford, England). Unlike many of the other papers which simply applied evidence such as bones and pollen to find information on seasonality, Hamilton first tackled the basic problem of what seasonality means. She first defined her own interpretation of the term, and from that designed a model which incorporated the queries she might make of her data. Hamilton presented her model as four circles of increasing diameter, starting with astronomic events such as the summer solstice. The second circle dealt with climatic events such as winter and summer. The third covered the biological schedule of animals or plants, including time of harvest, time of birth, and resource availability. Finally, the fourth circle represented human activity, for example, eating something at a certain period as part of a social tradition.

This model brought together both functional aspects of seasonality—crops which have to be harvested at certain times, for instance—and more complicated social aspects which involve people who might undertake socially motivated behaviour during the year. Although she was unsuccessful in identifying seasonality from her bone remains, Hamilton's clear method nevertheless implied either non-seasonal factors were involved, or other techniques for determining seasonal exploitation, such as tooth cementum, need to be developed and applied to her data.

The final paper I wish to discuss in detail was given by John Tierney (University College Cork, Eire). Tierney's ethnographic work on the Aran Islands has surveyed farmlands where arable weed communities thought to be extinct or rare in the British Isles today are still thriving. Among the traditional crop weeds he has identified *Centaurea cyanus* (Cornflower), *Lolium temulentum* (Darnel) and *Avena strigosa* (Bristle Oat). This relict agricultural land is providing valuable ethnobotanical evidence for the archaeobotanist of Ireland and perhaps Northwest Europe where similar Mediterranean work may not be appropriate.

The combination of field study, covering topics such as agricultural regimes, weed communities and thatch, and historical resources, drawing on the Irish Folklore Commissions National Folklore Archive, are producing intriguing results. Tierney hopes to develop crop processing models for the region. This paper highlighted the potential of ethnographic work for archaeobotanical interpretation of a range of issues, including seasonality.

Many more papers deserve mention than can be summarized here. Anton Ervynck's (Instituut vor het Archeologisch Patrimonium (IAP), Belgium) humorous paper "The silence of the pigs" was another good example of the possibilities and limitations of deriving seasonality from teeth. It also addressed the complication of numbers of farrows per year. Brian Irving (York, England) looked at seasonal resources with fish remains but pointed out the difficulties if fish, in this case Atlantic Salmon (*Salmo salar*), are smoked and thus preserved.

The conference summary, given by Terry O'Connor, united the diversity of topics by reviewing general points which were raised. The need for more work, both biological and ethnographical, was made obvious from many papers. Seasonally available food may not necessarily be used immediately—storage or preserving will complicate recognition of seasonal behaviour. O'Connor noted that killing, butchery, preservation and storage are all necessary seasonal operations connected with livestock, and similar activities must apply to plant harvesting. The ethnohistorical record is a valuable tool to explore both functional and social aspects of seasonality. Finally, the issue of whether animals are inherently less storable than plants was put forward.

The theme of seasonality allows the archaeological record to be assessed on the scale of a human lifetime, as opposed to multiple generations. The social importance of seasonal activity, however, was missing from many papers, which primarily addressed functional or resource exploitation aspects. In general, although many insights into seasonality in the archaeological records were presented, more work is clearly necessary.

Overall, I felt the conference was extremely well organised with a nice balance between breaks and talks. As a newcomer to the AEA I felt very welcome and enjoyed meeting many of the members and discussing their work as well as mine. I was also impressed by the supportive atmosphere of the conference. This meeting was viewed as a forum for people to exchange ideas about their work and discussions were always positive and constructive, which I found very encouraging. The field trip on the last day provided a brief introduction to the wetland habitat of the Netherlands, the geography of the area, and land reclamation, as well as a visit to a local museum and the former harbour.

The proceedings of this conference will be published by the Institute of Pre- and Protohistory, Amsterdam. It will be dedicated to Willy Groenman-van Waateringe (IPP, Amsterdam) in recognition of her contribution to the field during her career.

Contributed by Wendy Smith, School of Archaeological Studies, University of Leicester, University Road, Leicester, LE1 7RH, England

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The Association of Environmental Archaeology (AEA) produces a journal, *Circaea*, published twice a year, and a quarterly newsletter (published February, May, August, and November). Membership is £12 sterling with a reduction to £6 sterling for students/unwaged. If you are interested in membership all enquiries should be made to: Gill Campbell, Membership Secretary, Association for Environmental Archaeology, The University Museum, Parks Road, Oxford, OX1 3PW, UK.

The next AEA Conferences are as follows:

Spring 1995	University of Sheffield, England
Autumn 1995	University of Bradford, England
Spring 1996	University of Birmingham, England
Autumn 1996	Arkeologisk Museum, Stavanger, Norway. □

Announcements

NPS Workshops in Cultural Resource Management

Low Altitude Large Scale Aerial Reconnaisance for Cultural Resource Managers

The National Park Service in association with San Juan College and Brigham Young University announces a workshop on Low Altitude Large Scale Reconnaissance (LALSR). Session 1 will run from May 5-14, and Session 2 from August 1-9; they will be located at the Remote Sensing and Geographic Information Systems Laboratory, San Juan College, Farmington, New Mexico. The workshop will include both lectures on the theory and practice of LALSR and practical experience in the construction of the aircraft and flight training. Included in the workshop will be discussions of photo interpretation as it applies to LALSR photography, and the applications of LALSR to cultural resource management.

Low Altitude Large Scale Aerial Reconnaissance has been applied to the recording of archeological and historical sites and features, as well as facilities mapping and environmental monitoring of water pollution and land fills. LALSR offers an efficient means of gathering high resolution photography at low cost.

The workshop instructor, James Walker of Brigham Young University, has developed and refined the techniques of LALSR over the past fourteen years. Jim has

taught LALSR to hundreds of individuals for uses ranging from the documentation of archeological and historical sites in North American and India to the monitoring of environmental pollution and facilities mapping.

Participation in the workshop is limited to 12 individuals per session. Be sure to indicate which session that you want to attend. Nomination forms for Session 1 must be received by the National Park Service no later than close of business on March 1, 1995, and for Session 2 no later than close of business on June 1, 1995.

Funding for the course is provided in part by the FY 1995 Partnerships in Cultural Resource Training (Cultural Resource Training Initiative). Additional information on the workshop and housing arrangements are available from Dr. Rick Watson, Director, San Juan College, Remote Sensing and Geographical Information Systems Laboratory, 4601 College Blvd., Farmington, NM 87402; tel 505-599-0373; fax 505-599-0385, and Steven De Vore, Course Coordinator, National Park Service, 12795 West Alameda Parkway, PO Box 25287, Denver, CO 80225-0287; tel 303-969-2882; fax 303-987-6675.

Remote Sensing/Geophysical Techniques for Cultural Resource Managment

This workshop is designed to provide a practical application of geophysical equipment and aerial photographic techniques available for the identification, evaluation, and ultimately, the conservation and protection of cultural resources. Instruction will be given in the use of and the interpretation of data from magnetometers, conductivity meters, resistivity meters, ground penetrating radar, metal detectors, and magnetic susceptibility and their applications to nondestructive subsurface investigations. The major emphasis of the training will be on the field use of the equipment. Instruction will also be offered in the use and interpretation of aerial photographic techniques and low-altitude, large-scale aerial reconnaissance.

The course, totalling 40 hours in 5 days, will run May 22-26, 1995. Class size will be limited to 40-50 participant. This course is co-sponsored by the National Park Service, the USDA Forest Service, and the USAF Air Mobility Command. The course will be located at the Cahokia Mounds State Historic Site, Madison and St. Clair Counties, Illinois. Lodging will be at the Holiday Inn, Collinsville, IL. Additional information concerning lodging will be provided to course participants.

Participants will include federal, state, and local governmental cultural resource managers and specialists (i.e., archeologists, historians, architects, and contracting personnel) as well as private contractors, university professors and students, and international cultural resource personnel, with specific responsibilities concerning the identification, evaluation, conservation, protection, and management of archeological and other cultural resources.

The 2,200-acre prehistoric Cahokia Mounds site, located six miles east of East St. Louis, contains a village and 65 preserved mounds. Monk's Mound, the site's centerpiece, covers more than 14 acres at its base and is 100 feet high. Evidence of the once-flourishing Mississippian civilization, the center of an enormous trade empire distinguished by social and political activity, spans the years A.D. 900-1500. At its peak, Cahokia had about 20,000 residents.

There is a $475.00 charge for course tuition. Checks must be made out to the National Park Service. Those wishing to attend must submit a nomination form by COB, March 15, 1995 to the National Park Service, RMR-PPO, ATTN: Steven De Vore, 12795 West Alameda Parkway, P.O. Box 25287, Denver, Colorado 80225-0287; tel 303-969-2882; fax 303-987-6675. Participants will be notified by March 31, 1995, as to their acceptance for the workshop. Federal personnel must process a 5-part SF-182 Training Form through their Regional Training Office and may submit either a check or purchase order to the National Park Service at the above mentioned address.

Short Course on Conservation of Geological Materials

A short course on Preventive Conservation of Geological Materials will be held in San Diego, California, USA, from 13-17 June 1995. Sponsored by International Academic Projects (London) and the San Diego Natural History Museum, the course will be instructed by Chris Collins, Conservator, Geological Conservation Unit, Sedgwick Museum, Cambridge University, and Sally Shelton, Director of Collections Care and Conservation, San Diego Natural History Museum. This is an intensive 5-day professional short course for anyone concerned with the care and conservation of geological-origin materials in collections, architecture, and sites of cultural and scientific importance. Topics to be covered include: the nature, identification, and characteristic degradation of mineral and stone types; environmental monitoring; techniques and care of sensitive materials; cleaning, adhesion, and consolidation updates; storage concerns; creating microenvironments; special concerns of fossils and fossil-bearing materials; special concerns of stone artefact collections; health and safety concerns (arsenic, asbestos, lead, mercury, radon, etc.) in geological collections; testing and protection; weathering, salt migration, and efflorescence; conservation of geological sites and in situ preservation; and product information and materials testing.

For further information and addition to the mailing list, please contact: Chris Collins, Geological Conservation Unit, Madingley Rise, Madingley Road, Cambridge CB3 0EZ, UK; tel 0223-62522; fax 0223-60779; or Sally Shelton, Director, Collections Care and Conservation, San Diego Natural History Museum, P.O. Box 1390, San Diego, CA 92112, USA; tel: 619-232-3821; fax: 619-232-0248; e-mail: LIBSDNHM@ CLASS.ORG. For a complete IAP catalogue, please contact Jim Black, International Academic Projects, 31-34 Gordon Square, London WC1H 0PY UK; tel: 44-71-387-9651; fax: 44-71-388-0283. □

WHO WE ARE:

The Society for Archaeological Sciences (SAS) began in 1977 with 100 charter members. We now have over 600 members, who work in academic settings, government offices, and private firms. We represent an international cross-section of the disciplines with input to archaeometry, including anthropology, biology, botany, chemistry, classics, geochemistry, geochronology, geography, geology, metallurgy, and zoology.

WHAT WE DO:

SAS encourages interdisciplinary collaboration and cooperation among scientists in archaeology and in the physical and natural sciences.

ACCOMPLISHMENTS:

- Enhancement of funding and research opportunities.
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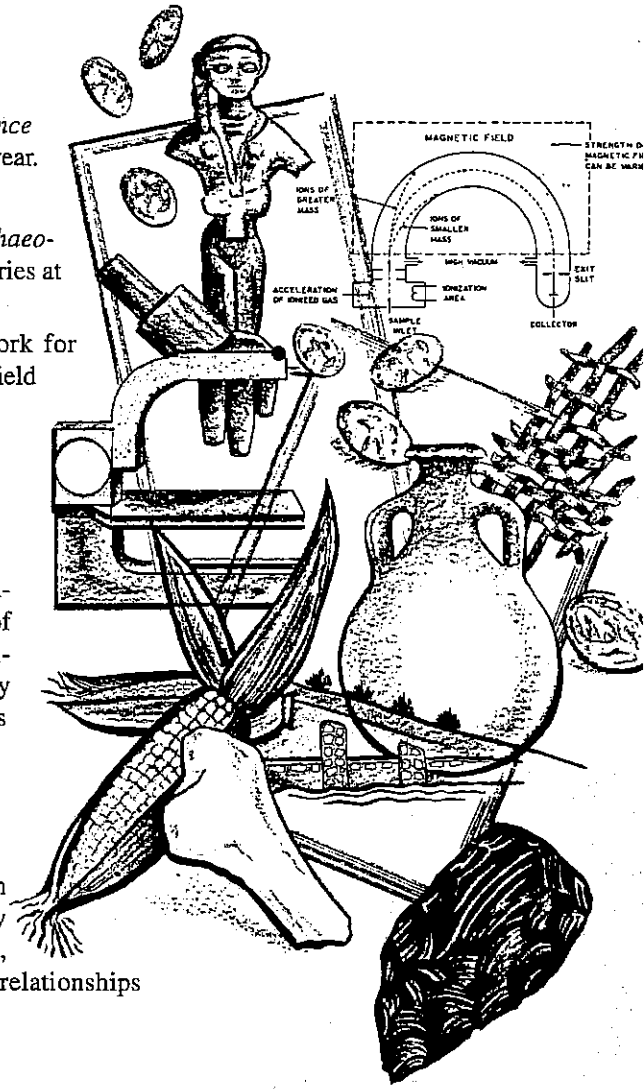

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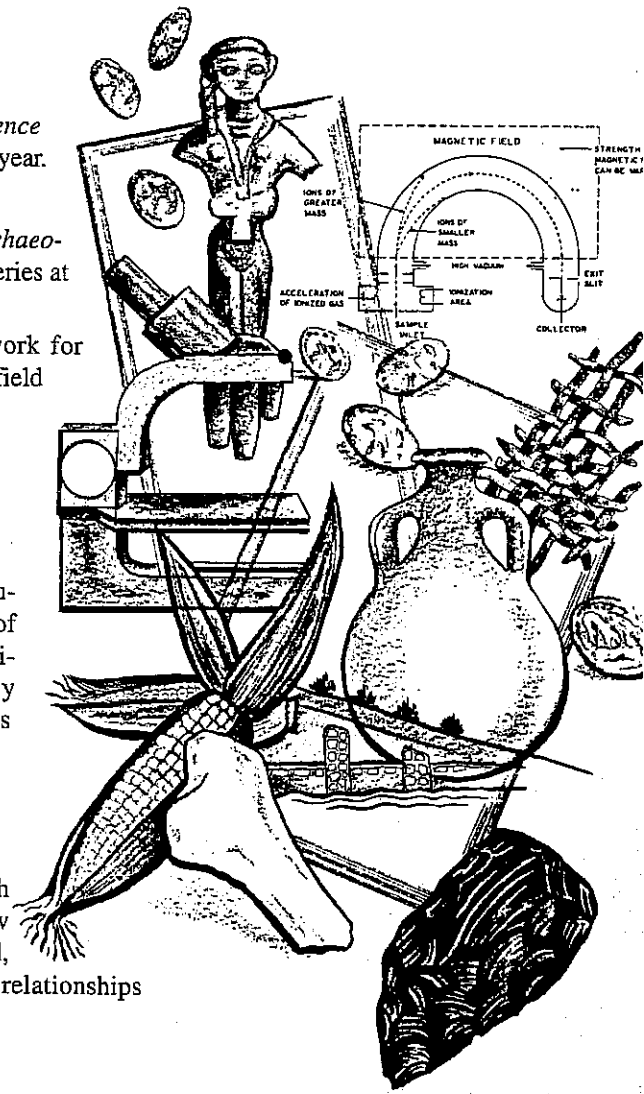

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Book Reviews

Investigations of Ancient Human Tissue: Chemical Analysis in Anthropology. Mary K. Sandford (ed.). Gordon and Breach Science Publishers. Food and Nutrition in History and Anthropology, Volume 10. xx + 431 pp., 51 tables, 54 figures. $90.00 (cloth).

Reviewed by Katherine M. Moore, Department of Behavioral Science, Bentley College, Waltham, MA 02154-4705

This book is an edited volume of papers selected from those presented at a symposium held at the 1988 Annual Meeting of the Pathology Association. The first four chapters include detailed introductions to the theory and methodologies of the field; they are followed by two case studies of diagenesis in bone and three case studies of applications to bone.

Many reviews and critiques of these techniques, in particular trace element and stable isotope analysis of bone, have appeared recently, including several by authors whose work appears in this volume. The distinctive features of this book are its focus upon diet, health, and disease, rather than dietary reconstruction alone, and the coverage of hair as well as bone (no other tissues are covered). With the exception of Ambrose's review of stable isotope analysis of bone collagen and apatite, the samples described are for the most part whole bone (or whole hair), rather than discrete components.

"The distinctive features of this book are its focus upon diet, health, and disease, rather than dietary reconstruction alone, and the coverage of hair as well as bone."

Sandford outlines trace element analysis of bone using a model of a continuum from a biogenic source (the kind we are looking for) to a diagenetic one (to be avoided). Her emphasis is on factors affecting the incorporation of trace elements in body tissues rather than on the environmental or ecological patterns of abundance which produce patterns of trace elements in populations. Factors which affect diagenesis are treated briefly here, but are covered exhaustively (and pessimistically) in a chapter by Radosevich.

In a companion chapter, Ambrose gives an overview of bone stable isotope ratio analysis. He emphasizes the current uncertainty over fractionation factors, the incorporation in collagen and apatite of different dietary constituents, and variation in stable isotopes of plants and animals in different climates. Relatively little attention is given to the diagenesis of bone collagen or the possibility that skeletal elements may vary in isotopic composition.

The case studies showcase some of the archaeological contributions of the stable isotope technique. Katzenberg shows explicitly what had been gained by the use of chemical techniques over traditional archaeological analysis. Verano and DeNiro show an approach to ethnic difference based on diet for the coast of Peru. These contributions are good context for the chapter by J.A. Williams on the potential status of bone chemical analysis as a "must have" in cultural resource management protocols. Given the pressure of continuing reburial programs, the credibility of a destructive technique must be commonly agreed upon.

The chapters on trace element analysis of hair (Sandford and Kissling), potential new trace elements of interest (Klepinger), and assessment of diagenesis in the La Paloma sample (Edward and Benfer) were careful accounts of technique-building, but were not convincing new avenues to the past. Understanding of how elements enter or leave tissues and how specific diagenetic processes would affect these elements was often missing. In addition, the suggestions for what kind of dietary or health differences might be observable using these techniques were based on circumstantial or conflicting evidence. Even patterns with intuitive appeal, such as that observed between hair Fe concentrations and incidence of porotic hyperostosis (to which iron deficiencies can be a contributing factor) could not be related to systematic studies of modern human populations. The list of possible confusions or complications in these analyses is daunting; few of us have the time and resources to devote to analyses that won't always work, or work only for a few kinds of samples.

In addition, the authors did not concur on appropriate techniques for various situations. A failure of nerve emerges when individual papers are compared: Sandford offers little support for the theoretical basis of multi-element trace element studies in Chapter 1, yet the extensive multi-element study by Edward and Benfer appears in Chapter 5. In fact, this amount of disagreement within bone chemistry is almost typical. Perceptions of problems and potentials often come from experience with the samples and regions at hand. Sources of elements or isotopic enrichment are not uniform and diagenetic processes can be wildly variable. Given the current stage of development of the scientific field, Radosevich's analysis of "wishful thinking" should be a warning to all who would continue in these fields.

Sandford should be commended for the insertion of many additional references and cross-references, and for the fine subject index. The high price of this volume may keep it off the shelves of many interested scholars, but they will still want to consult it. □

Book Reviews

Ancient Metallurgy in the USSR: The Early Metal Age. E.N. Chernykh. Cambridge University Press, Cambridge, 1992. xxiii +335 pp., index. $90.00 (cloth).

Reviewed by Duncan E. Miller, Department of Archaeology, University of Cape Town, South Africa

Professor E.N. Chernykh is the director of the Moscow Spectrographic Analysis Laboratory (formerly the Laboratory for Spectral Analysis) of the Institute of Archaeology, Academy of Sciences, Moscow. This book summarizes twenty-five years of research and the results of over 50,000 chemical analyses of metal artifacts. Dr. Chernykh has also drawn on the work of numerous colleagues to create a synthesis of regional metallurgical history from the fifth millennium to the beginning of the first millennium B.C. The geographic area covered includes eastern Europe and the northern half of Asia. Most of the relevant primary publications are in Russian and not readily accessible to western archaeologists, which makes this a particularly important and useful summary.

"This is a monumental work ... I recommend it to all archaeologists involved in research into the European and Asian Bronze Age, to all historians interested in the early development of metallurgy and its consequences, and to all archaeometallurgists no matter what their geographic areas of interest."

This book is well written and readable, although it is a review dense with information and not the sort of book one would want to read straight through from cover to cover. I would recommend starting with the first, fifth, and tenth chapters, which are discussions, before diving into the details of the assemblages described in the intervening chapters. The English is clear and the arguments well stated.

Dr. Chernykh's analysis is presented in terms of 'metallurgical provinces'—large historical production systems operating in related production centers. A hierarchy of 'metallurgical and metalworking focuses' are subsumed under each metallurgical province, and these are related broadly to groups of identifiable archaeological cultural entities. This approach enables the presentation and discussion of technological and cultural complexity associated with extractive metallurgy and metalworking on a temporal and regional basis. As a result of this stratagem the book is sensibly structured, without imposing a false rigidity on the vast field of detail.

The presentation depends on the description of assemblages of metal artifacts and metalworking tools. These are given as much archaeological context as space permits and are illustrated copiously with line drawings and a few black and white photographs. Throughout there are maps showing the regions under consideration or the location of specific sites, but the serious reader unfamiliar with the geography will also need to have a good atlas at hand. The maps themselves are not very informative, with little or no labelling of geographic features. There are no metallographic descriptions and the interpretation of the results of chemical analyses are stated (with references to the primary sources) without any numerical details. For instance, there are no details of the chemical analytical methods employed in source tracing studies, so their veracity cannot be checked easily. The majority of relevant references here are in Russian so the non-Russian reader must take the author's word on authority. This can be frustrating, but it is understandable in a work of this magnitude.

The first chapter—"The Early Metal Age"—establishes the archaeological background, defines the terminology of metallurgical focuses and provinces, elaborates the regional metallurgical chronology with the aid of two clear and very useful time charts, and discusses the problems of chemical sourcing of ores. This discussion is thorough and cautious, which goes some way towards relieving anxieties about the lack of primary chemical data.

The next chapter—"The Copper Age"—describes three early metalworking focuses in the USSR, and closes with a discussion of the surprisingly intense production of the Carpatho-Balkan Metallurgical Province. The following two chapters—"The Early Bronze Age in the Circumpontic province," and "The Middle Bronze Age in the Circumpontic province"—cover the metallurgical history of the vast area surrounding the Black Sea, from about the mid-fourth millennium B.C. to the mid-third millennium B.C. Many cultural and technical focuses are described in detail individually and the material synthesized in the next chapter—"The Circumpontic Metallurgical Province as a system." The daunting task of synthesizing vast amounts of information is dealt with very successfully in this chapter, which was submitted in English after the rest of the book had been translated. The text is lucid and it is well illustrated, with maps showing the distribution of alloys and artifact types, and with appropriate graphics.

The chronological and geographic presentation of metal assemblages continues in the next four chapters—"The Early and Middle Bronze Age outside the Circumpontic province," "The Late Bronze Age: the Seima chronological

horizon of the Eurasian province," "The end of the Late Bronze Age: the Eurasian and European Metallurgical Provinces," and "The Late Bronze Age: the Central Asian, Irano-Afghan and Caucasian provinces." These are not simply descriptions of the artifacts, but integrated summaries of the typological and chemical analyses presented within archaeological contexts. The interplay between technology and other aspects of culture is explored here, with aspects of the metallurgical history illuminating the social history and vice-versa. The complexity of late Bronze Age history is evident and the tenuousness of our knowledge is made explicit.

The final chapter highlights some of the questions and problems arising from this work. This is a particularly welcome measured appraisal of the achievements of the past twenty-five years of archaeometallurgical research in the USSR but also draws attention to the limits of interpretation based on the metallurgical data. Dr. Chernykh closes with an invitation to others to join the discussion. This book will make it possible for far more scientists to do so.

For a long book there are remarkably few printing errors (I noticed spelling mistakes on pages 118, 152, 165, 179, and 184, and the chapter header on pages 71 through 97 is incorrect). The only substantial criticism I have is the total lack of any index entries listing particular metals. Admittedly the entries for "copper" and "bronze" could be ludicrously long, but the location of references to gold, silver, tin, lead, antimony, and zinc would have been useful.

This is a monumental work, dense, thought-provoking, and hence not a quick or easy read. But I recommend it to all archaeologists involved in research into the European and Asian Bronze Age, to all historians interested in the early development of metallurgy and its consequences, and to all archaeometallurgists no matter what their geographic areas of interest. □

The Desert's Past: A Natural Prehistory of the Great Basin. Donald K. Grayson. Smithsonian Institution Press, Washington, DC, 1993. 356 pp. $44.95 (cloth).

Reviewed by Elizabeth J. Lawlor, Department of Anthropology, University of California, Riverside

This is a very readable and comprehensive natural history of a region that sorely needed one. I recommend *The Desert's Past* to anyone who has traveled through the Great Basin and especially to those whose work includes aspects of Great Basin archaeology but who do not have a mastery of allied specialties. Donald Grayson has done a remarkable job of taking numerous and disparate studies, distilling them into coherent accounts of prehistoric Great Basin climate, vegetation, fauna, and culture, and making them accessible to readers with no prior knowledge of the disciplines or data that inform the text. There are a few omissions of certain kinds of data, but that is inevitable in a book of this scope. The quality of the work, however, deserves better presentation, both in the quality of the paper and in the printing of the figures and maps.

Grayson's purpose for writing this book, as stated in the Preface (p. xvi), is "simple: to outline the history of Great Basin environments from the time of the last maximum advance of glaciers in North America [about 25,000 B.P.] to the arrival of Europeans and their written records. In so doing, I hope to convey the dynamic nature of the landscapes and life of this region." This in itself is a daunting task, given the wide range of data he synthesizes over a 427,000 km² region: ancient shorelines; baskets; bird, reptile, and mammal bones; glacial moraines; human demographics; packrat middens; pollen spectra; stone tools; vegetation associations; volcanic ash deposits; and more.

"Grayson has done a remarkable job of taking numerous and disparate studies, distilling them into coherent accounts of prehistoric Great Basin climate, vegetation, fauna, and culture, and making them accessible to readers with no prior knowledge of the disciplines or data that inform the text."

But Grayson, who received the 1986 Fryxell Award for Interdisciplinary Research from the Society for American Archaeology, sets himself an even more challenging task: to enable the interested public to understand not only the results but the research methods involved. His intended audience is visitors to the national parks and wilderness areas in the Great Basin: readers with little or no prior knowledge of the Great Basin environment (current or past), radiocarbon dating, pollen analysis, packrat middens, equilibrium-line altitudes, projectile point chronologies, or issues such as the peopling of the New World. On the other hand, "if my scientific colleagues find it of value as well, then I will be happier still" (p. xvii).

One other goal is apparent in the notes and final chapter, but is not stated explicitly. Grayson wants readers to appreciate the complexity of the Great Basin Desert and to become aware of the damage it has suffered in the last 150 years and the potential damage of further mismanagement. His approach is not simplistic but considers a complicated set of causes and effects of a recent population explosion of deer and of the introduction of cheatgrass (*Bromus tectorum*).

The book succeeds in addressing the intended audience, and, though more scholarly, is in the same genre as John McPhee's (e.g., 1980) popular nonfiction series about North

Book Reviews

American geology. A few sections read like a standard review article, but usually the prose is lively, frequently illustrated (but see below), and uninterrupted by citations (though each chapter ends with reference notes and there is an extensive bibliography).

There is, for example, a discussion of the changing shorelines of pluvial lakes such as Pleistocene Lake Bonneville (of which Great Salt Lake is a remnant), illustrated with maps, photos, tables, and graphs. Grayson brings home the dynamic nature of the landscape by putting the reader in it (1) in various vehicles setting land speed records on the Bonneville Salt Flats; (2) on a contemporary highway; (3) with the Donner Party on its westward migration in 1846; (4) with an imaginary Donner Party if it had attempted its migration in A.D. 1700 and (5) with the same imaginary party at 16,000 B.P. As someone who does not specialize in geomorphology, I found this passage both more coherent and more accessible than other accounts of Lake Bonneville I have read, and Grayson's writing style made me want to take an extended trip through the Great Basin just to read the ancient landscape for myself.

Other exceptional passages include an account of John C. Fremont's expedition of discovery of the Great Basin, a fine introduction to radiocarbon dating, and a balanced assessment of the Calico Site, a supposed pre-Clovis site in the Great Basin. These sections, along with the sections on reconstructing Great Basin paleovegetation and on the controversial Numic Spread, would be good readings for introductory-level college classes.

The book is organized roughly chronologically, with early chapters providing background on the region and on the Ice Age, and later chapters covering Great Basin environments of the Late Pleistocene and Holocene, prehistoric and historic cultures, and a discussion of recent environmental impacts. In an early section, the "Great Basin" is defined hydrographically, physiographically, floristically, and culturally, and Grayson decides to include the Mojave Desert because of hydrography and culture, while recognizing that floristically it is a separate region.

Considering that Grayson is an anthropologist by training, it is surprising that less than one third of the book discusses prehistoric, historic, or ethnographic research about people. The rest is concerned with other aspects of Great Basin prehistoric natural history. But much of the information in those sections (e.g., on prehistoric mammal populations) was collected as part of archaeological research.

There is some controversy about whether any culture should be included in a natural history. As Donald and Catherine Fowler (1991) have said (and as Grayson notes in the Preface), including non-western cultures in a natural history implies that they are more primitive or more natural than western peoples and is thus pejorative. But Grayson does a balanced, if flawed, job of battling this on three fronts. First, he points out that both the prehistoric Great Basin cultures and the early historic settlers were "closer to nature" than current residents of the region "in the very real sense that they had to cope far more directly with the environmental challenges that nature dealt them" (p. xvii). Second, he dispatches with the notion that the Great Basin was somehow "pristine" (i.e., "devoid of significant human influence") prior to the arrival of Europeans (p. 299): archaeological evidence clearly shows prehistoric over-hunting of pronghorn and mountain sheep. Third, he includes a lengthy passage on the Donner Party (infamous for its death rate and cannibalism while trapped by snow for months in the Sierra Nevada), including historic archaeology of the camp and demographic analysis of the mortality rates.

The focus on the Donner Party is the flawed aspect alluded to above. While it is a well-researched and well-written chapter on its own, it seems out of place in the rest of the book; I got the impression that it is included mainly because Grayson did the research. He gives three other reasons, however: it allows him to present not only aboriginal peoples but "also the historic archaeology that deals with all peoples within the Great Basin after written records become available" (p. xvi); it is "one aspect of Great Basin history that many Americans learn about during their childhood" (p. 277); and the archaeological work illustrates the usefulness of using archaeological techniques on the recent past. The problem is that no other historic archaeology is presented; there is no discussion of the mines, railroad camps, military forts, or populations of Chinese and other ethnic groups which "had to cope with the environmental challenges that nature dealt them," and which have been investigated with archaeological techniques. A broader chapter at least alluding to these, and perhaps covering two or three in depth (including the Donner camp), would have been more in keeping with the focus and structure of the rest of the book.

A natural history can be expected to try to appeal to readers with many different types of interests, and it would be impossible to satisfy everyone in both the range and depth of information covered. Omissions that especially bothered me were in the realms of geology and paleoethnobotany. Geologically, the Great Basin is wrinkled by faulting and uplift that occurs to this day, and spotted by lava that has flowed well within the time limits included in the book. I would have liked to see maps of the major faults and most recently active volcanoes, along with a discussion of how these affected the springs, plants, animals, and humans of the region, beyond the discussion of the volcanic ash deposits used as chronological markers.

As for paleoethnobotany, I searched in vain for the introduction to flotation analysis that I expected to accompany the otherwise good section on "Learning about

Ancient Vegetation" (pp. 115-119), and for the nonexistent entries in the otherwise extensive index for "archaeobotany," "ethnobotany," "flotation," "paleobotany," "paleoethnobotany," or "plant use." The section on prehistoric archaeology includes limited data about the use of plants for food, integrated (as they should be) into discussions of particular subregions. But the discussion of seed use (pp. 244-246) focuses on the indirect evidence of grinding stones, and on ethnoarchaeological studies of the cost of seed processing. As Grayson points out (p. 241), "there is no direct evidence that ground stone tools from stemmed point sites were used for plant processing—evidence that might be provided, for instance, by residue analysis"—or by analysis of carbonized seeds, chaff, and wood charcoal recovered by flotation. The problem is not that Grayson failed to include such data, but that the data don't exist; for some reason, Great Basin archaeologists have lagged behind their counterparts in other regions in routinely collecting large soil samples for flotation. Until this becomes routine, our knowledge of plant use in the region will continue to be limited to conjecture from the grinding stones and to rarely preserved remains such as coprolites and the pickleweed chaff in Danger Cave.

Given the overall quality of *The Desert's Past* (even the copyediting is nearly flawless), it deserves a better presentation than it was given. The cover is very inviting, but the paper within feels cheap and thin; photos and text are unusually visible through one another. The maps and graphs are clear and numerous, but are quite unattractive, with a very thin, obviously computer-generated font and stark black-and-white (no gray, and rarely patterned) fill. These problems were immediately apparent to me and to others who gathered to look through my review copy. Perhaps the publisher was trying to keep the final price affordable, but it would be a shame if that decision discourages potential readers from becoming more educated about a fascinating region full of public land in jeopardy.

REFERENCES CITED

Fowler, D.D., and C.S. Fowler
1991 The use of natural man in natural history. In *The Spanish Borderlands in Pan-American Perspective*, edited by D.H. Thomas, pp. 37-71. Columbian Consequences, vol. 3. Smithsonian Institution Press, Washington, D.C.

McPhee, John
1980 *Basin and Range*. Farrar, Straus, Giroux, New York. □

Archaeometallurgy (continued from page 1)

the Cantabrian Mountains and on the north Spanish coast. This tour will be co-guided by Dr. Mike Bent. For the first time a tour of western Britiain, including Cornwall, Devon and Wales, is to be offered for 11 nights and 12 days in Autumn 1995. For more information write Atalaya Tours Ltd., at their new office: Ceinionfa, Capal Dewi, Aberystwyth, SY23 3HR, Wales, telephone 44-1970-828989, fax 44-1970-617290.

Southeby's has announced a one-month specialist study course on Understanding Jewellery to take place 5-30 June 1995 in London. There are additional gemology sessions available. The total cost is £1660. For more information write Southeby's Educational Studies, 30 Oxford Street, London W1R 1RE, England, telephone 44-71-323-5775, fax 44-580-8160.

New Organization

The Classical and Medieval Numismatic Society has been formed in Canada for the study of ancient and medieval coinage and its history. Membership, which is international, includes collectors, historians, students and others interested in the subject. The Society has two publications: *The Anvil*, a bimonthly containing news and short articles, and *The Picus*, a scholarly journal published annually. The Society organizes meetings and seminars and has a growing collection of books, mainly of auction catalogues, and counterfeit coins for instructional purposes. Regular membership is $20 ($12 for students) in Canada; for non-Canadian addresses these amounts should be in US dollars. Airmail is extra: in Canada $6.00, in US $9.00, overseas $15.00. The address of the Society is P.O. Box 956 Station B, Willowdale, Ontario M2K 2T6, Canada, telephone 416-490-8659.

New Publication

The author of *Decorative Arts 1850-1950: A Catalogue of the British Museum Collection*, Judy Rudoe, writes us that a new edition (ISBN 0-7141-0567-8) was published in June 1994 which adds over a hundred recent acquisitions to the 1991 volume. The collection includes examples of interesting metalworking and patinating techniques. All objects in this collection are illustrated in the catalogue; there are 370 illustrations in monochrome and 25 in color. The revised edition is available in paperback for £25 and can be ordered from the publisher, British Museum Press, 46 Bloomsbury Street, London WC1B 3QQ England, telephone 44-71-323 1234, fax 44-71-436- 7315, telex 28592BMPUBSG. Judy Rudoe also noted that the Hull Grundy collection of jewellery at the British Museum has been reinstalled and can now be seen displayed in context.

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

Martha Goodway, Smithsonian Institution MRC 534, Washington DC 20560 USA; tel. 301-238-3700, ext. 164; fax 301-238-3709 □

Meetings Calendar

Susan Mulholland, Archaeometry Laboratory, University of Minnesota-Duluth, 10 University Drive, Duluth MN 55812, USA; tel: 218-726-7957; fax: 218-726-6556; e-mail: smulholl@ua.d.umn.edu

New listings are marked by a *; new information for previous listings indicated by a +. More information on some meetings is given in previous bulletins as indicated, e.g., "17(1):2" for volume 17, number 1, page 2.

1995

Feb. 20-25. South Asia Geological Congress. Columbo, Sri Lanka. N.P. Wijayananda, GEOSAS II Secretariat, NARA, Crow Island Mattakkuliy, Colombo 15, Sri Lanka; tel: 94-1-522008; fax: 94-1-522932.

\+ March 5-10. Pittcon '95 - Pittsburgh Conference and Exposition on Analytical Chemistry and Applied Spectroscopy. New Orleans, Louisiana. Pittsburgh Conference, Dept. CFP, 300 Penn Center Boulevard, Suite 332, Pittsburgh, PA 15235-5503; tel: 412-825-3220; fax: 412-825-3224. Invited symposia include: Unsolved mysteries (and problems) in ICP-MS; Future mass spectrometry approaches for structure determination of biomolecules; Technology forum: just for fun! (includes talks on Chemistry in art; Spectroscopic analysis of the Shroud of Turin); Frontiers in separation science.

* March 15-17. Society of Ethnobiology, 18th Annual Conference. Tucson. Suzanne K. Fish, Program Chair, Arizona State Museum, University of Arizona, Tucson, AZ 85721, USA; tel: 602-621-2556; fax: 602-621-2976; e-mail: Archaeo@ArizRVax. Theme: Culture and biological diversity—Past, present and future.

March 15-19. Association of American Geographers, Annual Meeting. Chicago, Illinois. Association of American Geographers, 1710 16th Street NW, Washington DC, USA; tel: 202-234-1450.

March 17-19. Sardinian Stratigraphy and Mediterranean Chronology—17th annual Tufts University Colloquium on Sardinian Archaeology. Medford, Massachusetts. Prof. Miriam S. Balmuth, Department of Classics & Archaeology, Tufts University, Medford, MA 02155, USA; tel: 617-627-3216; fax: 617-627-3610; e-mail: MBalmuth@emerald. Tufts.edu. 17(3):22.

March 26-30. 8th Conference on the Scientific Use of Statistical Software. Heidelberg, Germany. SoftStat '95, ZUMA, Postfach 12 21 55, D-68072 Mannheim, Germany; tel: 49-621-1246-174; fax: 49-621-1246-100; e-mail: softstat@zuma-mannheim.de.

April. Meeting on Early Smelting. Bochum, Germany. Dr. Andreas Hauptmann, Institut für Archaeometallurgie, Deutsches Bergbau Museum, Lohrheidestrasse 57, D-4630, Bochum 6, Germany; tel: 49-23-27-3704.

April. Central Asian Rock Art: Methodology for the Study of Petroglyphs. Paris. Henri-Paul Francfort, CNRS-UPR No. 315, 27 rue Damesme, 75013 Paris, France; tel: 33-1-45-80-27-77; fax: 33-1-45-80-15-53; e-mail: francfor@centrasie.msh-paris.fr.

April 2-7. Archaeological Chemistry Symposium, American Chemical Society National Meeting; sponsored by the Subdivision of Archaeological Chemistry, Division of the History of Chemistry, ACS. Anaheim, California. Mary Virginia Orna, Department of Chemistry, College of New Rochelle, New Rochelle, NY 10805, USA; tel: 914-654-5302; fax: 914-654-5387. 17(1):19.

* April 3-7. European Geophysical Society, 20th General Assembly. Hamburg, Germany. EGS Office, Postfach 49, Max-Planck-Str. 1, 37189 Katlenburg-Lindau, Germany; tel: 49-5556-1440; fax: 49-5556-4709; e-mail: egs@linaxl.dnet.gwdg.de. Includes symposium: Pre-instrumental seismcity—historical, archaeological and geological record of earthquakes (contact G.A. Papadopolous, EGS Interdisciplinary Working Group on Natural Hazards, Earthquake Planning and Protection Organization, 226 Messogion Avenue, 15561 Athens, Greece; tel: 301-6521451; fax: 301-6519899).

* April 3-7. 2nd Workshop on Pre-Pottery Neolithic Chipped Stone Industries. Warsaw. Stefan Kozlowskil, Instytut Archaeologii, Uniwersytet Warszawski, ul. Zwirki i Wigury 97/99, PL-02-089 Warszawa, Poland; tel: 48-22-236229; fax: 48-22-231162.

April 3-7. Geological Society of South Africa Centennial Geocongress. Johannesburg. Congress Secretariat, Centennial Geocongress, PO Box 36815, Menlo Park, 0102, South Africa; tel and fax: 27-12-47-3398.

* April 9-11. Annual Meeting of the Society for California Archaeology. Eureka, California. Breck Parkman, California Department of Parks and Recreation, 20 East Spain Street, Sonoma, CA 95476, USA; tel: 707-983-1519.

* April 10-12. International Conference on Ancient Mining, Metallurgy, and Conservation of Metallic Artifacts; sponsored by Supreme Council of Antiquities (Egypt), and Institute for Archaeometallurgical Studies (University College, London). Cairo. Dr. Kamal Barakat, Administrative Organizer, Egyptian Museum, Tahrir Square, Cairo, Egypt; fax: 20-2-775133. Post-conference visits to sites will be organized by the Supreme Council of Antiquities. Paper deadline: 1 Feb. 1995.

April 17-21. Materials Research Society, Spring Meeting. San Francisco, California. Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237, USA; tel: 412-367-3003; fax: 412-367-4373.

* April 23-26. Symposium on the Application of Geophysics to Engineering & Environmental Problems (SAGEEP); sponsored by ther Environmental and Engineering Geophysical Society. Orlando. EEGS, PO Box 4475, Englewood, CO 80155, USA; tel: 303-771-6101; fax: 303-843-6232. Preregistration deadline: 31 March 1995. Includes short course on Introduction to Applied Geophysics, and sessions on Archaeological applications; Advancements in electrical methods;

Advancements in ground radar methods; Advancements in seismic methods.

* April 26-30. Cultural Significance of Wetland Archaeology. Vancouver, British Columbia. Kathryn Bernick, University of British Columbia Museum of Anthropology, 6393 N.W. Marine Drive, Vancouver BC, Canada V6T 1Z2; tel: 604-822-6530; fax: 604-822-2974.

* May 3-7. Annual Meeting of the Society for American Archaeology. Minneapolis, Minnesota. Society for American Archaeology, 900 Second Street NE, Suite 12, Washington, DC 20002, USA.

May 17-19. Geological Association of Canada-Mineralogical Association of Canada, Joint Annual Meeting. Victoria, British Columbia. Chris Barnes, General Chair, SEOS, University of Victoria, PO Box 1700, Victoria, BC V8W 2Y2, Canada; fax: 604-721-6200.

May 24-28. 21st Annual Conference and Training Workshop, International Institute for Conservation–Canadian Group. Calgary. Heather Dumka, HC-CG Conference '95, Glenbow Museum, 130 9th Avenue SE, Calgary, Alberta, T2G 0P3, Canada; tel: 403-268-4185.

* July 2-14. International Union of Geodesy and Geophysics, 21st General Assembly. Boulder. IUGG General Assembly, c/o American Geophysical Union, 2000 Florida Ave. NW, Washington DC 20009, USA; fax: 202-328-0566; e-mail: iugg_xxiga@Kosmos.AGU.org. Symposia include: Human impact and the Earth's environment; Archaeosecular and palaeosecular variations (convenor Charles Barton, Australian Geological Survey Organisation, GPO Box 378, Canberra, ACT 2601, Australia; fax: 61-6-249-9986; e-mail cbarton@agso.gov.au).

July 3-5. Archaeological Science Conference; held in co-operation with the Council for British Archaeology Archaeological Science Committee. Liverpool. The Science Conference Organisation, Department of Archaeology, 14 Abercromby Square, University of Liverpool, PO Box 147, Liverpool, L69 3 BX, UK. Abstract deadline: November 1994. Papers invited on all aspects of the applications of science within archaeology.

* July 10-16. International Exhibition of Publications on Archaeology; organized by the Association of Cypriot Archaeologists, the Cyprus Association of Bibliophiles, and the House of Cyprus and Cypriological Publications (MAM). Nicosia. MAM, PO Box 1722, 1512 Nicosia, Cyprus; tel: 357-2-464698; fax: 357-2-465411.

July 11-18. International Workgroup for Palaeoethnobotany, 10th Symposium. Innsbruck. Dr. Klaus Oeggl, Institut für Botanik der Leopold-Franzens-Universität Innsbruck, Sternwartestrabe 14, A-6020, Innsbruck, Austria.

July 17-Aug. 11. AMS-SIAM (American Mathematical Socety-Society for Industrial and Applied Mathematics) Summer Seminar in Applied Mathematics. Park City, Utah. AMS-Summer Seminary Conference Coordinator, AMS Meeting and Conference Department, PO Box 6887, Providence, RI 02940, USA; e-mail: dls@math.ams.org.

Aug. International Symposium: Alternative Pathways to the Early State. Vladivostok. Dr. Nikolay Kradin, Institute of History, Archaeology and Ethnology, Far Eastern Division, Russian Academy of Sciences, 89 Pushkinskaya Street, Vladivostok, 690600, Russia.

Aug. 3-10. XIV INQUA Congress. Berlin, Germany. Applications for travel grants available from Anne Linn, USNC/INQUA-HA-460, National Academy of Sciences, 2101 Constitution Avenue NW, Washington DC 20418; tel: 202-334-2744. Application deadline, including abstract and vita: 31 Jan. 1995.

* Aug. 29-Sept. 2. ECAART 4—European Conference on Accelerators in Applied Research and Technology. Zürich. Martin Suter, Chairperson ECAART 4, ETH Hönggerberg, Institute of Particle Physics, Building HPK, CH 8093, Zürich, Switzerland; tel: 41-1-633-2033; fax: 41-1-633-1067; e-mail: suter@imp.phys.ethz.ch.

Aug. 30- Sept. 8. International Rock Art Congress. Pinerolo-Torino, Italy. Robert G. Bednarik, Australian Rock Art Research Association, PO Box 216, Caulfield South, Vic 3162, Australia.

Sept. 4-8. From the Jomon to Star Carr: Hunter-gatherers of East and West Temperate Eurasia. Universities of Cambridge and Durham. Peter Rowley-Conwy, Department of Archaeology, University of Durham, 426 Sadler Street, Durham, DH1 3NU, UK; tel: 91-374-3632.

Sept. 14-19. Prehistory of Mining and Metallurgy. London and Bangor, UK. Dr. Paul Craddock, Department of Scientific Research, British Museum, London WC1B 3DG, UK; tel: 44-71-323-8797.

Oct. 9-11. ASMOSIA IV Conference. Bordeaux, France. Universite de Bordeaux III–CNRS, Maison de L'Archeologie, Applied Physic Lab, CRIAA, F-33405 Talence Cedex, France; tel: 33-56-84-51-60; fax: 33-56-84-51-57.

Nov. 6-9. Geological Society of America, Annual Meeting. New Orleans, Louisiana. Vanessa George, Geological Society of American, 3300 Penrose Place, Boulder, CO 80301, USA; tel: 303-447-2020; fax: 303-447-1133.

Nov. 15-19. American Anthropological Association, Annual Meeting. Washington DC. American Anthropological Association 4350 North Fairfax Drive, Suite 240, Arlington, VA 22203, USA; tel: 703-528-1902.

1996

May 20-24. International Symposium on Archaeometry. Urbana-Champaign, Illinois. Sarah Wisseman, ATAM Program, University of Illinois, 116 Observatory, 901 S. Mathews, Urbana, Il 61801, USA; tel: 217-333-6629; fax: 217-244-0466; e-mail: wisarc@ux1.cso.uiuc.edu.

Aug. 4-14. 30th International Geological Congress. Beijing. Secretariat Bureau, 30th International Geological Congress, PO Box 823, Beijing 100037, P.R. China; tel: 86-1-8327772; fax: 86-1-8328928. 17(3):23.

Sept. 8-14. 13th Congress of the International Union of Prehistoric and Protohistoric Sciences. Forlí. Alla Segretaria del XII Congresso U.Z.S.P.P., Casa Saffi, Via S. Marchesa 12, I-47100 Forlí, Italy; fax: 39(0)-543-35805. □

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Deadlines for Submissions:

No. 1 November 15 — No. 2 February 15
No. 3 May 15 — No. 4 August 15

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