

SAS Bulletin

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From the Editor

For those of you who have not heard it elsewhere, the University of Wisconsin's archaeometry program has enjoyed a positive addition while the SAS has suffered an administrative loss. **Christine Prior**, for several years the Associate General Secretary for the SAS, has taken a new job at the Radiocarbon Laboratory in Madison. Chris maintained the membership records, collected dues, managed mailings, and generally kept the Society's affairs in good order. But all good things must end; graduate students find jobs and move on. We all wish Chris the best in her new position and we are sure that she will distinguish herself in that role. In the meantime, we also hope and trust that the Office of the General Secretary will adjust smoothly to the change in personnel. Chris' new address is: *Dr. Christine Prior, C14 Lab/Center for Climatic Research, University of Wisconsin-Madison, 1225 West Dayton Street, Madison, WI 53706.*

I recently learned of the formation of the International Association for Obsidian Studies, an organization of individuals and institutions interested in glass studies. After informal discussions, the group coalesced at the 1989 Society for California Archaeology meeting in Los Angeles. The IAOS now has by-laws, officers, and a growing membership list. It is operating as a special-interest group affiliated with the SAS, and will use the *SAS Bulletin* as a publication outlet. The goals of the group include: 1) develop standards for analytic procedures and ensure inter-laboratory comparability; 2) develop standards for recording and reporting obsidian hydration and sourcing results; 3) provide technical support in the form of training and workshops for those wanting to develop their expertise in the field; 4) provide a central source of information regarding advances in obsidian studies.

The IAOS has set an ambitious course of standard development, conference symposia, and information dissemination. A regular membership is \$20.00, and an institutional membership is \$50.00. We expect to hear more of them in the near future. If you wish to join, or learn more, please contact:

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By the time members read this column, the International Symposium on Archaeometry in Heidelberg will have ended. The Symposium organizers pulled together a diverse and fascinating collection of presentations on geoarchaeology, geophysical prospection, dating of inorganic materials, provenance studies, technology of metals and non-metals, and a thematic session entitled "Chronology and Environment of Early Man: The Archaeometric Approach." The Symposium Proceedings will be published by Birkhäuser Verlag AG Basel. SAS members will enjoy a detailed report on the meetings by our own **Gar Harbottle, Jim Burton, and Rob Sternberg**, who have graciously offered to provide their account of the meeting in Volume 13 Number 3 of the *Bulletin* for those of us who could not attend.

A final note: a quick perusal of our mailing list reveals that while our membership is growing, we have not penetrated the libraries of the world. Pass on a subscription request to your favorite institutional library.

In This Issue

- | | |
|---|-------|
| Book Reviews: <i>The Anasazi in a Changing Environment, Phytolith Analysis, Paleoethnobotany, Recent Vertebrate Carcasses and their Paleobiological Implications</i> | 2-7 |
| News of Archaeometallurgy | 8-9 |
| Meeting Announcements: Scandinavian Archaeometry, Association for the Study of Marble, Canadian Spectroscopy, and Australian Archaeometry | 9-10 |
| Meetings Calendar | 10-14 |

Book Reviews

The Anasazi in a Changing Environment. GEORGE J. GUMERMAN, editor. School of American Research Advanced Seminar Series, Cambridge University Press, New Rochelle, New York, 1988. xx + 317 pp., tables, figures, biblio., index. \$49.50 (cloth).

Reviewed by Stephen Plog, Department of Anthropology, University of Virginia.

The prehistoric era in the American Southwest was dynamic, with significant change through time in population density, technology, subsistence strategy, degree of aggregation, and social organization. Early in the development of archaeological studies, scholars saw a possible relationship between cultural dynamics and the nature of the Southwest environment, which is relatively inhospitable for human populations. The length of the growing season, amounts of precipitation, or both, approach or fall below the minimum required for successful agriculture, and natural productivity is low compared to many other regions. Moreover, prehistoric environmental characteristics were also highly variable through time and across space. Thus, droughts, alluvial degradation, and a variety of other environmental processes have long been proffered as explanations of the observed patterns of culture change.

Decades later, these same explanations are still being debated in one of the most intensively studied archaeological regions in the world. *The Anasazi in a Changing Environment* is one of the most recent studies in that tradition. Focusing on the northern Southwest area occupied by Anasazi peoples, the goal is familiar: to identify cultural-environmental relationships (p. 11). This collection of papers was initially presented at a School of American Research Advanced Seminar in 1981. Many of the authors also have cooperated in research since 1966 and have produced several earlier studies of environmental-cultural relationships. But this volume is the longest and most detailed of the presentations to date, "the culmination of an ambitious long-range" (p. 1) study.

The volume begins with an historical perspective on environmental-cultural research in the Anasazi area written by George Gumerman and with a general model of Anasazi behavioral adaptation authored by Jeffrey Dean. These are followed by detailed treatments of environmental information: alluvial chronologies and hydrologic change (Thor Karlstrom), pollen and vegetation (Richard Hevly),

and dendroclimatology (Jeffrey Dean). The next two chapters focus on cultural change; Shirley Powell discusses some of the decisions necessary to estimate prehistoric demographic change and Robert Euler summarizes demographic and cultural dynamics in the region. In the following paper (Chapter 8), several members of the group (Gumerman, Euler, Dean, Hevly, and Karlstrom along with Fred Plog) evaluate proposed relationships between environmental and cultural change.

The positive contributions of the volume are many. In Chapter 2, Dean provides a useful distinction between types of environmental change and their likely relationship to adaptive strategies. These descriptive types provide a first step toward breaking down environmental variation into meaningful components for studying human behavior. The chapters summarizing environmental information are also valuable. Karlstrom provides the first detailed exposition of an alternative model of alluvial cycles, an issue that Southwestern geologists and archaeologists have long debated. Dean's excellent presentation on dendroclimatology also includes an innovative discussion and test of models of relationships between climate and fluvial processes. Although those tests seem to be ignored in later chapters, the strength of the effort is the presentation of the environmental information.

The remaining contributions are uneven in quality. Powell provides a thorough summary of the issues involved in demographic reconstructions, highlighting the types of information that archaeologists need to collect. But the reader is somewhat surprised when Euler (Chapter 7) then summarizes demographic change in 15 different localities in the northern Southwest without discussion of either the estimation methods (methods that varied considerably from one study to another) or the likely differences in the accuracy of the reconstructions. Those familiar with the northern Southwest also will find serious errors in Euler's contribution. For example, we know from several studies that range expansion on northern Black Mesa is synonymous with upland movement, yet the former is dated to ca. A.D. 800 and the latter to A.D. 1050. In fact, there were cycles of range expansion and upland movement in the Black Mesa region. This example also illustrates another serious problem with the cultural information presented in Chapter 7 and used in the tests of environmental-cultural relationships in Chapter 8: processes of behavioral change are reduced to events or presence-absence phenomena. Finally, despite the espoused commitment to a regional perspective, as opposed to a focus on localities, there is no regional synthesis of behavioral change. Such a synthesis cannot be achieved by simply adding up localities one by one.

Book Reviews

Evaluation of the hypothesized environmental-cultural relationships in Chapter 8 is the most critical part of the volume. Here again the environmental component is the strength of the chapter because for the first time the group generates quantitative, interval-scale measurements of environmental variation and change that should allow more precise assessments of correlations with culture change. Unfortunately, however, the interval scale measurements are reduced to nominal categories when comparisons are actually made with patterns of culture change. In addition, those comparisons utilize the cultural information presented in Chapter 7 and are thus questionable from the outset.

The authors seem to acknowledge problems with the data when they state that statistical tests of their hypotheses would be inappropriate given "incomplete understanding of the archaeological record and the imprecise dating" (p. 251). But they subsequently proceed to test the hypotheses by comparing expected and observed frequencies of particular types of behavior and subjectively assessing the probability of the difference between those frequencies. If such evaluations are to be attempted, I believe that statistical tests are a more appropriate and a more explicit way of assessing those probabilities. When I conducted difference of proportions tests (in the cases where adequate information was presented), 5 of the 8 (63%) hypothesized relationships (pp. 252-253) between culture change and population growth were confirmed, but only 4 of 23 (17%) predictions regarding relationships with environmental change were supported. The case for environmental causation is thus a very weak one at best.

Despite the long collaboration of some of the researchers and the eight years that elapsed between the seminar and publication, the volume is characterized by considerable disagreements and inconsistencies, only few of which can be noted here. Gumerman (p. 12), for example, claims that there "are strong positive correlations between mesic periods and population increase and xeric episodes and population movement and abandonment" in 11 different localities on the Colorado Plateau. In contrast, Dean (p. 38) states that "except in the most extreme cases, population change is probably not closely related to environmental variation" and he denies that "a one-to-one relationship exists between climatic variability, as measured by tree growth, and human behavior." To cite another example, the general systemic models that Gumerman endorses in the introductory chapter are nowhere to be seen in the remainder of the volume where unidirectional, mechanistic models prevail. These inconsistencies are confusing to the reader and are never addressed. Differences in opinion among a group this large are not unexpected and, indeed, could have contributed to the strength of a volume if they

had been explicitly debated. Minimally, such issues should have been outlined in the introduction and afterward, chapters that currently are ineffective in summarizing the questions addressed in the volume and the problems that remain to be resolved by future research.

Collectively, the papers in this volume fail to provide a useful evaluation of the relationship between behavior and environment in the northern Southwest. Throughout, the basic model is one in which cultural behavior was a response to environmental stimulus. (The model presented by Dean is perhaps the primary exception to this statement.) As in previous syntheses by the group, the authors deny (p. 275) that the approach can be characterized as environmental determinism, and occasional qualifiers are included in early chapters allowing that culture change can be a product of changes in behavior. Nevertheless, they consistently focus on three variables—environment, demography, and cultural behavior—and consistently discuss the first two variables as independent and the latter as dependent (e.g., p. 231).

At times the authors hint that cultural causation has been excluded for the sake of simplicity, but no "culminating" test of a truly systemic model could proceed in this fashion. If interaction among three variables is likely, to exclude the effects of one variable can only hinder explanatory efforts. Studies must recognize that responses to environmental change are contingent on existing social relationships, economic strategies, and political ties; demographic change is determined by a variety of behavioral factors including diet, methods of food processing, division of labor, and patterns of regional organization. In short, variation in human behavior cannot be treated as a dependent variable. This volume has made an important contribution to our understanding of the Southwest paleoenvironment, but if we are to make significant progress in answering long-standing questions about Southwestern prehistory, we will have to direct more attention to anthropological questions about the history, structure, and internal dynamics of prehistoric societies.



Book Reviews

Phytolith Analysis. An Archaeological and Geological Perspective. DOLORES R. PIPERNO. Academic Press, Inc., 1988. xii + 280 pp., tables, figures, plates, appendix, references, index. \$49.00 (cloth).

Paleoethnobotany. A Handbook of Procedures. DEBORAH M. PEARSALL. Academic Press, Inc., 1989. xii + 470 pp., tables, figures, references, index. \$59.95 (cloth).

Reviewed by Vaughn M. Bryant, Jr., Department of Anthropology, Texas A&M University.

The publication of these two texts within a year of each other has furnished a long overdue contribution to the field of paleoethnobotanical literature. In the early part of this century botanical remains from most archaeological sites were either discarded, ignored, or at best included as brief checklists in appendices. It has only been during the last several decades that archaeologists have begun to consider the botanical remains at sites as potentially important data. However, a major problem for most archaeologists has been a lack of easy-to-find and easy-to-understand articles or books outlining the types of botanical materials that should be saved, the proper collection procedures that should be used, the kinds of techniques and pitfalls one should use or avoid during analyses, and the way to interpret the botanical data recovered from cultural deposits. Both books provide answers to these important questions.

A major strength of both books is that each is designed as a procedural manual and handy reference guide for researchers in the field of paleoethnobotany and for others in a variety of related disciplines such as archaeology, paleoecology, geology, and paleobotany. The language in both books is concise, clear, and readable. The data presented are written for professionals, but the topics are so thoroughly explained that these texts should become major guides and reference sources for informed amateur archaeologists as well as college students who are beginning their careers. The materials in both texts are well documented and contain original as well as current citations of important reference sources.

Piperno's book on phytolith analysis is the first comprehensive text ever published on the topic of plant crystals, the tiny microfossils composed of hydrated silica or cal-

cium oxalate that form within certain types of specialized cells of many plants. When released into the environment following the death and decay of the plants, phytoliths accumulate in localized deposits and, like other types of remains, become index fossils of the plants they represent. Also, because they are inorganic and subject to different types of decay mechanisms than organic plant matter, phytoliths are often the only remaining evidence of plants that were once used by a culture or once grew in a given locale. Thus, in sites where severe organic oxidation has occurred phytoliths are often the only evidence left to testify as to the presence of agriculture, plants used for food and shelter, plants used in room structures, plants stored in pottery or basketry, and about the sequential changes in local and regional paleovegetation.

Phytoliths have been known and studied for more than 150 years yet the application of phytolith analysis to paleoecological, archaeological, and paleoethnobotanical research was poorly understood and, consequently, severely limited. This has now changed thanks to the scholarly efforts of a few dedicated researchers, such as Dolores Piperno. Her pioneering efforts are illustrated and explained in this volume.

The book on phytoliths is divided into eight chapters, followed by a selection of SEM and light microscopy photographs and an appendix outlining several keys to phytolith types. It is not a long book, but it is packed with valuable information. It is an excellent text, however it has several flaws which are minor but annoying for the reader. For example, a number of the photographic plates at the end of the text are out of focus and the captions for some do not include a scale. Also, I found the index to be too restrictive. For example, there are no references in the index to plant families, genera, or individual plant taxa mentioned in the text. There are also no index references under the entry on phytoliths concerning morphology, the terms used to identify specific phytolith morphological forms, relationship of phytoliths to paleoecology, or pH.

Chapter One briefly reviews the history of phytolith research and explains why it has taken so long for phytoliths to become accepted as important microfossils by archaeologists, paleoecologists, and paleoethnobotanists. Chapter Two examines the factors that lead to the production and deposition of phytoliths in plants. Piperno notes correctly that accurate interpretation of the fossil phytolith record is directly dependent upon a sound understanding of the production, deposition, preservation patterns, and taxonomy of phytoliths.

In the third chapter the author lists and describes the major

Book Reviews

morphological classes of phytoliths and examines the type of plant tissue that produces them. Of special interest in this chapter is her discussion of phytolith taxonomy found in both New and Old World domesticates and her summary of the phytoliths found in the lower vascular plants, the many elaborate types and wide varieties found in the monocot and dicot varieties of angiosperms, and phytolith types characteristic of the gymnosperms.

Other chapters describe the recent laboratory procedures perfected for the successful extraction of phytoliths from fresh or fossil plant materials from various types of sediments. Also explained is the importance of sampling in an archaeological context, the types of samples to collect, the number of sampling locations one should consider, the sample size that is needed for analysis, and the geographical region represented by the phytolith spectrum at any given location. She also notes that phytoliths can be recovered from a variety of materials including geological sediments, from calcified deposits on the teeth of ungulates, residues stuck to the surfaces of stone tools once used to cut or scrape plant fibers, fibers used to make perishable artifacts, vegetative binding materials used to make mud and clay bricks, residue from coprolites, and soils of midden deposits. Phytoliths found in pottery have even been used to identify the types of plant fibers used as temper.

The three most important chapters of Piperno's text are found near the end of her book. The first of these discusses the theory of why phytolith research is valid and the methods used to compile phytolith data. The second details the many ways in which phytolith research can be directly applied to solving problems in archaeology. It points out, for example, why in many areas of the world no fossil plant materials are generally recovered from archaeological sites and why in those areas researchers should rely on phytoliths to provide the needed data they seek. The last of these three chapters discusses the applications of phytolith research in the reconstruction of paleovegetational sequences from a region and notes that under ideal circumstances phytolith data can often refine and elaborate the information obtained through other reconstruction processes. This is eloquently illustrated by her reconstruction of vegetational sequences in Panama where fossil pollen and fossil phytolith data of the same deposits complemented each other and provided a refinement of the plant sequence that neither technique could have provided alone. In addition, in that study she pioneered the use of phytolith concentration values and showed how those data could provide new levels of interpretation not previously possible.

The second book, Pearsall's text on paleoethnobotany, is a

masterpiece of organization, presentation, and content. The book closely follows the sequence of topics on paleoethnobotany Pearsall teaches her students at the University of Missouri. It is obvious from reading the text that a great deal of time, energy, and concern has gone into the training of her paleoethnobotany students as well as in the preparation of this volume.

The author states that her purpose for writing this text was three-fold. First, she wanted to describe the approaches and techniques used in paleoethnobotany, which she defines as "the study of the interrelationships between human populations and the plant world through the archaeological record." Second, she wanted to provide an overview of the types of paleoethnobotanical materials currently being recovered from archaeological sites. And, third, she hoped to produce a technical handbook on paleoethnobotany covering field sampling, flotation technology, screening techniques, laboratory procedures, and analytical methodology currently being used to evaluate and interpret fossil plant data. Pearsall also states that another reason she wrote this book stems from her growing concern about the quality of training being offered paleoethnobotany students and the problems of maintaining technical and analytical consistency within the profession.

The book is divided into six chapters. The first chapter serves as an introduction to the field of paleoethnobotany, provides an historical overview, summarizes the current status of the profession, and offers suggestions about the future of the discipline. Chapter Two is a detailed review of how to recover plant macroremains from archaeological sites. The topics covered in this chapter are extensive and include a discussion of how to build and operate manual and machine-assisted flotation systems, the advantages and disadvantages of various types of flotation systems currently in use, how to select the best type of plant recovery system for each type of archaeological site, the cost effectiveness, efficiency, and speed of various types of recovery systems, recovery problems associated with various soil types, advantages and pitfalls of using coarse versus fine sieving, differences between freshwater and saltwater flotation systems, large and small site sampling strategies, and technical hints for using floating or screening sampling systems.

In Chapter Three the author discusses how one should identify, analyze, and interpret macroremains. She stresses that comparability of analyses between researchers and paleoethnobotany labs is often not possible today but that it would be possible once the profession develops standardized procedures. Pearsall also discusses how to

Book Reviews

build comparative macroremain study collections, how to prepare modern plant reference collections, and how to teach basic techniques that should be used for the correct identification of seeds, fruits, nuts, wood, roots, tubers, fibers, leaves, non-woody stems, and cultivated remains. She stresses that current identification techniques should be expanded to include electron microscopy, electrophoresis, starch grain analysis, isotopic analysis, and morphometric analysis when appropriate. The final section of this chapter explains how one should interpret macroremain data using the various types of qualitative and quantitative procedures currently in use and available.

The fourth and fifth chapters cover archaeological palynology and phytolith analysis, respectively. Both chapters are organized similarly and begin with a brief introduction about the nature, occurrence, and history of each microfossil category. In Chapter Four her introduction is followed by a discussion of fossil and modern pollen sampling strategies, types of data that can be generated through pollen data, laboratory procedures, and quantitative techniques used in the presentation and interpretation of pollen analytical data. In Chapter Five Pearsall examines the entire range of phytolith research including taxonomy, laboratory processing techniques, refinement of quantitative techniques, the impact of environment on phytolith production, techniques useful in archaeological field sampling for phytoliths, how to prepare and use phytolith comparative reference collections, and the advantages of using both quick scanning and relative counting techniques when examining prepared phytolith samples. In the concluding part of Chapter Five she examines the strengths, weaknesses, and potential future of archaeological phytolith research. She notes, for example, that the potential applications of phytolith analyses are only now beginning to be realized by most paleoethnobotanists.

The final chapter examines how the analysis of paleoethnobotanical data can provide solutions to research problems in archaeology. Pearsall addresses the strengths and weaknesses of each category of paleoethnobotanical data and identifies how the data interrelate and supplement each other. She concludes by pointing out that the use of a combination of macro- and microremains can often strengthen interpretation. The combination can provide a more nearly accurate perspective of how plants were once used than can the information derived from only a single-technique (i.e., seeds, charcoal, pollen, phytoliths, etc.) type of analysis.

Even though both books are somewhat expensive, they are must reading for archaeologists and paleoethnobotanists and should be kept readily available as handy references.

Today, more than ever before, archaeologists are concerned with collecting and using the fossil plant record from sites to strengthen and elaborate the other types of data they recover. This has been beneficial, yet it has created problems as well. In recent years a number of "pseudobotanists" have emerged who are sampling, analyzing, and trying to interpret the fossil plant remains from archaeological sites. In many cases their results have added confusion to our data base rather than providing solid new evidence. It must be hoped that the two new books by Piperno and Pearsall will enlighten many of the individuals currently involved with the sampling and interpretation of paleoethnobotanical remains from archaeological sites and correct the problems that are currently arising. In addition, the books will provide a valuable reference for archaeologists concerned with collecting and using the information provided by the fossil plant record at their sites. Finally, those of us in the field of paleoethnobotany hope that these new books will inform and encourage dedicated graduate students interested in paleoethnobotany to seek the training needed to become competent professionals.



Book Reviews

Recent Vertebrate Carcasses and their Paleobiological Implications. JOHANNES WEIGELT (translated by Judith Schaefer, with a foreword by Anna K. Behrensmeyer and Catherine Badgley). University of Chicago Press, 1989. xvi + 188 pp., plates, references, index. \$19.95 (paper), \$60.00 (cloth).

Reviewed by Elizabeth S. Wing, Florida Museum of Natural History.

The observations by Johannes Weigelt (1890-1948) of the manner of death of vertebrates and the forces that shape the conformation of the carcass and promote its preservation were first presented in a book entitled *Rezente Wirbeltierleichen und ihre paläobiologische Bedeutung* published in 1927. This was translated by Judith Schaefer and is now available in both hard cover and paperback to the English reader. The observations, described in a charming anecdotal style, were made during field work in the 1920s. The focus of much of these studies and his test case of "the carcass assemblage at Smithers Lake" (chapter 4) took place in the Texas coastal plain, though he drew on examples of animal deaths and fossils from around the world to illustrate his points. These studies of the causes of death, processes of disarticulation of the carcass, and burial of the remains in the sediments were made with an eye toward explanations in paleobiology.

The book is subdivided into five chapters that proceed logically from death and its aftermath through modes of death, laws governing positions of recent and fossil vertebrate carcasses, a detailed description of his test case (the carcass assemblage at Smithers Lake) and its origin, and a description of other examples of carcass assemblages and concentrations in the geologic past. This is followed by a very brief conclusion in which he pleads for the development of this new field of endeavor that requires close observation of the conditions under which animals die and the characteristics of their deposition.

Most of the descriptions of death assemblages are of mass deaths or of long term entrapments. These mass deaths are primarily due to catastrophic environmental conditions such as sudden freezes, floods, droughts, or of changes in water conditions, which become suddenly too saline or depleted of oxygen. Other death assemblages are the result of traps, such as quicksand, mud, or tar in which

animals may become bogged down. These traps may operate over long time spans as did the tar pits of Rancho la Brea. Others are the result of human actions, such as the oil spills that cause mass deaths of sea birds. Weigelt cites other human disturbances, short of outright hunting, that have caused mass deaths among wild animal populations, such as the competition between cattle herders in Wyoming and the Wapiti populations. Weigelt documents mass die-offs resulting from natural events with equanimity but clearly deplures human action in such events, providing an insight into the sensitivity of the author.

The impact of this book for archaeological research is more in the methods employed than in its content. Apart from the study of kill sites, particularly game drives that resulted in mass kills, this book does not address the results of human hunting seen in the accumulation of animal remains in an archaeological midden. The documentation of the stages in the disarticulation of a carcass subjected to environmental forces has a parallel in the experimentation and observation required for an understanding of patterns of human waste disposal. Weigelt presents an excellent model for the details required by such investigation.

The author would probably be amazed by the growth and importance of this new field of study, taphonomy, and the impact it has had in paleobiology and archaeology. The example he set in making close observations of not only the animal carcass but also the ecological conditions at the site of the animal's death, and backing these up with experimentation, should not be lost in taphonomic studies. This book serves as an inspiration for continued research of this kind.



News of Archaeometallurgy

A study tour of Rio Tinto and the Iberian pyrites belt leaves Birmingham, England, for Spain May 17, returning May 24. This is the fourth such tour conducted by Atalaya Tours and is limited to seven participants. The fee of £440 includes airfare from the U.K.; flight arrangements can be made for direct flight from North America. For further information call James Thorburn (0) 0970 611038, (H) 0970 625137, or write him at Atalaya Tours, Ceinionfa, Penglais Terrace, Aberystwyth, Wales SY23 2ET, United Kingdom.

Plans for the three conferences being held sequentially in London in June are firming up. First is the Fake? Symposium at the British Museum June 7-9, which coincides with the museum's exhibition, "Fake?: The Art of Deception," which opened March 9 and does not close until September 2. The fee for the conference is £45 (£18 for one day). Send your name and address to Mark Jones, Department of Coins and Medals, British Museum, London WC1B 3DG, England.

The second meeting, the Fifth International Symposium of Jewelry Studies: Decorative Techniques in Jewelry, will be held June 12 and 13 at the Society of Antiquaries, Burlington House, Picadilly, London. It will be preceded by an introductory lecture by Dr. Beatriz Chadour at 6 p.m. on June 11, also at Burlington House. Dr. Chadour will speak on the gold treasure of the *Nuestra Senora de la Concepcion*, a Spanish galleon that sank on its return voyage from Manila to Acapulco. For information on the symposium write Jack Ogden, Independent Art Research Ltd., 2 D'Arblay Street, London W1V 3FD.

The third meeting is the British Museum Research Laboratory Colloquium on Surface Coloring and Plating of Metals to take place June 14 to 16 at the British Museum. The conference fee is £45, includes lunch on the 14th and 15th and an evening reception at the Fakes? exhibition. For information write Susan La Niece, Research Laboratory, British Museum, Great Russell Street, London WC1B 3DG, or telephone 01-323-8226.

The Society for Industrial Archaeology is holding its 19th Annual Conference in Philadelphia from May 31 to June 3. For information on the conference and the tours of historic structures and industrial operations, write Sally Elk or Carmen Weber, Philadelphia Historical Commission, 1313 City Hall Annex, Philadelphia, Pennsylvania, 19107, telephone (215) 686-4543.

The International Metallographic Society is including sessions on archaeometallurgy in its annual conventions in Cincinnati, 22-25 July 1990 and in Monterey, California, in 1991. The Chairmen for the 1990 meeting are H. J. Caolne, Batelle, 505 King Avenue, Columbus, Ohio, 43201, telephone (614) 424-4271, and R. S. Crouse, Martin Marietta

Energy Systems, Oak Ridge National Laboratory, Post Office Box 2008, Oak Ridge, Tennessee, 37830, telephone (614) 574-4485.

The 7th International Congress on the Industrial Heritage will be held September 2-9 in Brussels on the theme of technologies, organization of work and changes to the industrial landscape. For information write the International Committee for the Conservation of the Industrial Heritage (ICCIH) Belgium, rue Ransfort 27, B-1080 Brussels, Belgium.

In 1992 there will be a symposium in New York on Ancient Jewelry Technology to coincide with the annual meeting of the Society of North American Goldsmiths and with the opening of an exhibit at the Fashion Institute of Technology on ancient and historical methods of making jewelry. It is expected that this exhibit will travel to Goldsmiths' Hall in London and the Schmuckmuseum in Pforzheim. For information write Professor Samuel Beizer, Chairman, Jewelry Department, Fashion Institute of Technology, 227 West 27th Street, New York, New York, 10001, telephone (212) 760-7820.

The meeting of the *Comite pour la Siderurgie Ancienne* of the UISPP ably organized by Elzbieta Nosek last fall in the Holy Cross mountains of Poland included two practical demonstrations. The first was direct process iron smelting in which nearly everyone present took their turn at the bellows, and the other was bloom smithing by Peter Crewe. He has concluded as a result of repeated replication that the forging of a solid bloom requires forty to sixty heats with initial forging temperatures limited by the slag to those well below welding temperature.

Forty-three articles from the series in *Historical Metallurgy* published in the CIM Bulletin have been reset and reprinted as a book, *All That Glitters: Readings in Historical Metallurgy*, edited by Michael L. Wayman (Montreal 1989). Some of these articles are classics of their kind. Half are on Canadian metallurgical history, the other half on developments in metallurgy generally and range from Ursula Franklin's consideration of old iron nails to P. Molera's description of the Catalan forge. Copies (ISBN 0-919086-24-1) can be ordered for \$50 (CIM members \$40) plus \$3 postage and handling from the Publications Order Department, Canadian Institute of Mining and Metallurgy (CIM), 1 Place Alexis Nihon, #1210-3400 de Maisonneuve Blvd. West, Montreal, P.Q. H3Z 3B8 Canada. For convenience in foreign exchange, they accept Visa, Mastercard and American Express.

The proceedings of the First Romanian Conference on the Application of Physics Methods in Archaeology, held 5-6 November 1987 in Cluj-Napoca was edited by P. T. Fran-

Announcements

Scandinavian Archaeometry Symposium

May 1991

golpol and V. V. Moriariu and published by the Central Institute of Physics. The paper by I. Bobos on raw material identification (pp. 97-100) discusses Roman iron slag; C. Cosma et al (pp. 101-112) report neutron activation analyses of Greek and Roman silver coins; and V. Foran et al (pp. 146-164) report XRF analyses of a 13th century Byzantine gold hoard. The volume was issued in 1988 by Institutul Central de Fizica Information and Documentation Office, Bucharest P. O. B. 5206, Romania. For information write Vasile V. Morariu, Institute of Isotopic and Molecular Technology, P. O. Box 700, R-3400 Cluj-Napoca, or Petre T. Frangopol, Institute of Physics and Nuclear Engineering, P. O. Box MG-6, R-76900 Magurele-Bucharest, Romania.

The International Tin Research Institute published a review by A. Chapman of so-called 'tin pest' in their journal, *Tin and Its Uses* (ISSN 0040-7941; No. 160, 1989, pp. 2-3) titled "Relative effectiveness of antimony, lead and bismuth in retarding the beta to alpha transformation of tin." Copies can be obtained from the International Tin Research Institute, Kingston Lane, Uxbridge, Middlesex UB8 3PJ, England, telephone 0895 72406, fax 0895 51841; or from the Tin Information Center of North America, 1353 Perry Street, Columbus, Ohio, 43201, telephone (614) 424-6200, fax (614) 424-6924.

The Archaeological Conservation Newsletter began publication in 1989 and includes regional and overseas news. The annual subscription for three issues is \$10 sent to the ACN Coordinator, P. O. Box 1105, Pacific Palisades, California, 90272. Volume 1 (1989) is still available for \$10.

The Almyras excavation of Zurich University's Department of Prehistory is located on Cyprus southwest of Nicosia. It is a copper smelting site found in close association with a mine and the remains of mineral processing. Three types of furnace (one may be a roasting kiln) have been identified. The site dates by carbon 14 between Cypro-Archaic II and Late Hellenistic period. This agrees with the typology of the slag, which corresponds to the blocky, Type B, slag of Kouchy and Steinberg's classification system. Initial publication will be in the 1990 Report of the Department of Antiquities, Nicosia, Cyprus. The site is unusually complete and it is hoped that it will provide materials for studying the details of early smelting such as partitioning of elements in the ore between the metal and the slag. For information write Walter Fasnacht at his new address, Kuntslergasse 16, 8006 Zurich, Switzerland, telephone 01-257-2046.

If you have any archaeometallurgical news to contribute, please call Martha Goodway at (301) 238-3733, or write her at CAL MSC, Smithsonian Institution, Washington, D.C., 20560. Note new fax number: (301) 238-3709.

Planning is underway for an archaeometric symposium to be held by members of the Scandinavian Archaeometry Center in May of 1991. With financial support from the Nordic Minister Council, this meeting will provide an opportunity for interaction between a number of different research groups.

The SAC is a recently-organized center founded by a group of archaeologists and natural scientists, and is located in the Physics Department of the Chalmers University of Technology and the University of Gothenburg. The main objective is to establish links between archaeology and different branches of natural sciences, and to stimulate cooperation between these two groups. SAC aims to complement the goals of PACT and invites cooperation from interested scientists both inside and outside Scandinavia.

Dr. Peter M. Fischer, SAC Chairman, Physics Department, Chalmers University of Technology, S-412 96 Göteborg, Sweden, Telephone: +46-(0)31 - 72 34 32; EARN: F8BUE@SECTHF51.

Association for the Study of Marble and Other Stones in Antiquity

Second Biennial Meeting
October 15-20, Leuven, Belgium

The Second Biennial Meeting of ASMOSIA will be held at the Huis van Chièvres. The theme of the meeting will be "Ancient Building and Statuary Stones: Quarrying and Provenance." Papers will be accepted for both oral presentations and for poster sessions. Topical research or review papers are invited. The final program will be prepared after a review of the submitted abstracts by an international board of examiners. Proceedings will be published by Peeters at Leuven within a year of the meeting.

Those interested in attending the meeting should contact the organizers by May 1, 1990. The deadline for receipt of abstracts is June 15, 1990. Abstracts of 200-300 words in English should be informative to allow a proper judgment by the examiners.

Contact Dr. Norman Herz, CAS/Geology Department, University of Georgia, 110 Riverbend Road, Athens, GA 30602, USA, or Dr. Marc Waelkens, Archaeology and Art History Dept., University of Leuven, Blijde Inkomststraat 21, 3000 Leuven, Belgium.

Announcements

36th Canadian Spectroscopy Conference
Brock University, St. Catharines, Ontario
August 1-3, 1990

Call for Papers

This annual spectroscopy conference includes a session on archaeometry. Papers dealing with the application of analytical techniques to problems in archaeology are invited. Persons interested in participating should contact:

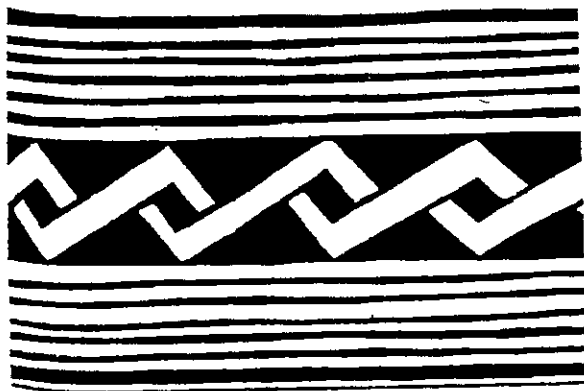
Marilyn Laver, Lavinco Conservation Sciences Services, 60 Gwendolen Crescent, Willowdale, Ontario, Canada M2N 2L7, Telephone (416) 730-8813.

Fourth Australian Archaeometry Conference
The Australian National University, Canberra
February 11-14, 1991

The program will be aimed at highlighting recent developments in Australia and overseas which are opening new approaches to prehistory and palaeosciences. Conference topics will include applications to archaeology of: biological techniques and microscopic remains, DNA studies, chronology, provenance studies, materials analysis, computer applications and authenticity studies.

The organizing committee would be pleased to accept suggestions, papers, or indications of interest as soon as possible. For further details on abstracts, registration and accomodation contact the organizers at:

Archaeometry Conference, Prehistory Department, RSPacS, The Australian National University, GPO Box 4, Canberra ACT 2601, Australia. FAX: 062 571893; BITNET: THL410@CSC.ANU.OZ.



Meetings Calendar

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., "12(4):13" for volume 12, number 4, page 13. The Meetings Calendar editor receives additional information for many of the listed meetings. You may contact him, preferably by BITNET, for further details.

May

May 1-3. First Circumpolar Symposium on Remote Sensing of Arctic Environments. Yellowknife, Northwest Territories, Canada. Helmut Epp, NWT Remote Sensing Centre, Government of the NWT, PO Box 1320, Yellowknife, NWT, Canada XC1A 2L9 (403) 920-3329; FAX (403) 873-0221.

May 3-4. 21st Annual Pittsburgh Conference on Modeling and Simulation. sponsors include: University of Pittsburgh School of Engineering; Society for Computer Simulation; Systems, Man and Cybernetics Society. Pittsburgh. W.G. Vogt, Modeling and Simulation Conference, 348 Benedum Engineering Hall, University of Pittsburgh, Pittsburgh, PA 15261. 13(1):15.

May 3-5. Population Society of North America, Annual Meeting. Toronto. PAA, 1429 Duke Street, Alexandria, VA 22314. 13(1):15.

May 4-5. Future of the Past: American Archaeology in AD 2001; 7th Annual Center for Archaeological Investigations' Visiting Scholar's Conference. Carbondale, Illinois. LuAnn Wandsnider, CAI, Southern Illinois University, Carbondale, IL 62901 (618) 536-6 651; BITNET: GA3784@SIUCVMB. 13(1):15.

May 5-10. 23rd Annual Meeting on Scanned Image Microscopy, Related Techniques, and Applications. Maryland. Dr. Om Johari, Scanning Microscopy 1990 Meeting, PO Box 66507, AMF O'Hare, IL 60606-0507.

May 8-11. 12th International Conference on Biochemical Analysis. Munich. Biochemische Analytik 90, Nymphenburger Strasse 70, D-8000 Munich 2, Federal Republic of Germany.

May 13. 12th Annual Spring Systematics Symposium. Chicago. Kristine L. Bradof, Department of Geology, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496 (213) 922-9410,x298. 13(1):15.

May 14-15. Symposium on Analysis of Paints and Related Materials. Pittsburgh. Dorothy Savini, American

Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 (215) 299-5413.

* May 14-18. **Third International Conference on Ground Penetrating Radar.** Denver. Gary R. Olhoeft, U.S. Geological Survey, PO Box 25046 DFC MS 964, Denver, CO 80225-0046. Abstract deadline: 3/16/90. Case histories invited, including archaeological applications.

May 16-18. **Geological Association of Canada, Annual Meeting.** Vancouver. GAC-MAC'90, 801-750 Jervis Street, Vancouver, BC, Canada V6E2A9.

May 20-25. **7th International Symposium on Trace Elements in Man and Animals.** Dubrovnik, Yugoslavia. TEMA International Secretariat, Rowett Research Institute, Bucksburn, Aberdeen AB2 95B, United Kingdom.

May 20-25. **Society for Imaging Society and Technology (SPSE), 43rd Annual Conference.** Rochester. Prof. Rodney Shaw, Rochester Institute of Technology, Center for Imaging Science, One Lomb Memorial Drive, Rochester, NY 14623. 13(1):15.

May 21-24. **7th Symposium on Radiation Measurements and Applications.** Ann Arbor. Helen Lumm, 3034 Phoenix Memorial Laboratory, University of Michigan, Ann Arbor, MI 48109 (313) 764-6214. 13(1):15.

May 21-25. **6th International Conference on Archaeozoology.** Washington, DC. The International Council for Archaeozoology, c/o Department of Anthropology, National Museum of Natural History, Smithsonian Institution, Washington, DC 20560. 12(1):5.

May 21-26. **37th American Society for Mass Spectrometry Conference on Mass Spectrometry and Allied Topics.** San Francisco. Judith Watson, ASMS, PO Box 1508, East Lansing, MI 48823.

May 24-27. **Geological Society of Greece, 5th Congress.** Thessaloniki. Prof. D. Mountrakis, Aristotle University of Thessaloniki, Department of Geology, Thessaloniki 54006, Greece.

May 28-June 1. **6th International Conference on Hunting and Gathering Societies.** Fairbanks. Linda Ellanna, CHAGS 6, Anthropology Department, University of Alaska, Fairbanks, AK 99775. 13(1):15.

May 28-June 8. **8th International Conference on Modern Trends in Activation Analysis;** co-sponsored by National Natural Science Foundation of China and the Chinese Nuclear Society. Beijing. Chai Chaifang, Institute of High Energy Physics, Academia Sinica, PO Box 2732, Beijing, People's Republic of China.

May 29-June 1. **American Geophysical Union Spring Meeting.** Baltimore. AGU Meetings, 2000 Florida Avenue NW, Washington, DC, 20009 (202) 462-6900.

May 29-June 1. **European Association of Exploration Geophysics, 52nd Annual Meeting.** Copenhagen. J. Tychsén, Miljøministeriet, Amaliegade, 13, DK-1265, Copenhagen K, Denmark.

June

June 3-6. **Statistical Society of Canada, Annual Meeting.** St. John's, Newfoundland. C.A. Field, Program Chairperson, Department of Mathematics, Statistics, and Computing Science, Dalhousie University, Halifax, Nova Scotia, B3H 4H8 Canada.

June 3-8. **38th American Society for Mass Spectroscopy Conference on Mass Spectroscopy and Allied Topics.** Tucson. Judith Watson, ASMS, PO Box 1508, East Lansing, MI 48826 (517) 337-2548.

June 4-6. **Symposium on Optical Spectroscopic Instrumentation and Techniques for the 1990s: Applications in Astronomy, Chemistry, and Physics.** Las Cruces, New Mexico. International Society for Optical Engineering (SPIE), PO Box 10, Bellingham, WA 98227 (206) 676-3290.

June 4-6. **Canadian Quaternary Association and American Quaternary Association, 1st Joint Meeting.** Waterloo. A.V. Morgan, Quaternary Sciences Institute, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, N2L 3G1 Canada (519) 885-1211, ext. 3231; FAX (519) 746-2543; BITNET: FOSSIL@WATDCS. 12(2):6.

* June 4-8. **International Conference on Four Decades of Radiocarbon Studies: An Interdisciplinary Perspective.** Lake Arrowhead, California. R.E. Taylor, Conference Secretariat, Radiocarbon Laboratory, University of California, Riverside, CA 92521 (714) 787-5521; BITNET: RETAYLOR@UCRVMS. Conference will commemorate the beginnings of the use of C14 as a dating, biological and environmental tracer isotope and mark the major contributions that C14 has made to research in archaeology, biochemistry, environmental studies, geochemistry, geology, geophysics, hydrology, and oceanography.

June 6-7. **Nuclear Magnetic Resonance Imaging: Recent Developments and Future Prospects.** London. Scientific Meetings Secretary, Royal Society of Chemistry, 6 Carlton House Terrace, London SW1Y 5AG, United Kingdom (01-839-5561, ext. 278).

* June 7-9. **Symposium on Fakes.** London. Mark Jones, Department of Coins and Medals, British Museum, London WC1B3DG, UK. In association with a major exhibition

on: Fake? The Art of Deception.

* **June 8-9. International Symposium Honoring Sewall Wright.** Madison. James F. Crow, Department of Genetics, University of Wisconsin, Madison, WI 53706 (608) 263-4438. Invited speakers will discuss current research in areas pioneered by Wright: population genetics, statistics, evolution.

* **June 9-13. Annual Meeting of the American Society of Mammalogists.** Frostburg. Ron Barry, Department of Biology, Frostburg State University, Frostburg, MD 21532 (301) 689-4167.

* **June 11-21. Courses on microscopy:** Basic Course on Scanning Electron Microscopy and X-ray Microanalysis (June 11-15); Advanced Topics in Scanning Electron Microscopy and X-ray Analysis (June 18-21); Analytical Electron Microscopy (June 21-22). Bethlehem. Joseph Goldstein, Department of Materials Science and Engineering, Building 5, Lehigh University, Bethlehem, PA 18015 (215) 758-5133.

June 12-13. 5th International Symposium on Jewellery Studies; organized by the Society of Jewellery Historians. London. Jack Ogden, Independent Art Research Ltd., 2 D'Arblay Street, London W1V 3FD, UK.

June 13-15. Hydrologic Aspects of Global Climatic Change; Chapman Conference sponsored by the American Geophysical Union. Lake Cheilan, Washington. Meetings, AGU, 2000 Florida Avenue NW, Washington, DC 20009 (202) 462-6900.

+ **June 14-16. International Colloquium on Surface Colouring and Plating of Metals.** London. Mrs. S. La Niece, Research Laboratory, British Museum, Great Russell Street, London WC1B 3DG United Kingdom (01-323-8226/279). Papers on the plating and deliberate coloring and patination of metal surfaces from antiquity onwards.

June 21-22. International Symposium on Mapping and Geographic Information Systems; sponsored by American Society for Testing and Materials. San Francisco. Dorothy Savini, ASTM, 1916 Race Street, Philadelphia, PA 19103 (215) 299-5413. 13(1):16.

June 21-23. Classification and Clustering: Perspectives and Prospects; sponsored by Classification Society of North America. Logan. Michael P. Windham, Department of Mathematics and Statistics, Utah State University, Logan, UT 84322-3900. 13(1):16.

June 24-28. 7th World Ceramic Congress. Rimini, Italy. 7th CIMTEC, Satellite Symposium 1, PO Box 174, 48018 Faenza, Italy.

June 24-29. 4th International Conference on Geoscience Information; co-sponsored by: Geological Society of Canada, International Union of Geological Sciences, Geoscience Information Society. Ottawa, Canada. David Reade, GeoInfo IV Secretary-Treasurer, GEOSCAN Centre, 601 Booth Street, Ottawa, K1A 0E8 Canada (613) 992-9550. 13(1):16.

July

July 1-7. Society for the Study of Evolution Annual Meeting. Dr. Barbara A. Schaal, SSE Executive Vice-President, Department of Biology Washington University, St. Louis, MO 63130 (314) 889-6822.

* **July 2-6. 15th International Biometric Conference.** Budapest. 15th IBC Secretariat, E. Sos, Computer and Automation Institute, Hungarian Academy of Science, PO Box 63, H-1502 Budapest, Hungary.

July 2-6. State of the Art in Computer Graphics; co-sponsored by British Computer Society and Association for Computing Machinery. Edinburgh, Scotland. David F. Rogers, Program Chair, U.S. Naval Academy, Annapolis, MD 21402-5000 (301) 267-3283; E-MAIL: dfr@usna.mil.

July 2-6. 14th Congress of the Council of Mining and Metallurgical Institutions. Edinburgh, Scotland. The Secretary, The Institute of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, United Kingdom.

* **July 9-11. 8th British National Conference on Databases.** York. Dr. Peter Hitchcock, BNCOD-8, Department of Computer Science, University of York, Heslington, York YO1 5DD, UK (0904-432745; E-MAIL: ph@uk.ac.york.minster). Paper deadline: 1/8/90. Topics: design, implementation, and application of database technology.

* **July 9-12. 2nd International Meeting on Spectroscopy Across the Spectrum - Techniques and Applications of Analytical Spectroscopy.** Hertford, UK. P.R. Brawn, Unilever Research, Colworth Laboratory, Sharnbrook, Beds. MK44 1LQ UK.

July 16-20. International Conference on Luminescence. Lisbon. Sebastiao Formosinho, Secretariat of ICL 90, Centro de Quimica Fisica Molecular da Universidade Tecnica de Lisboa, Instituto Superior Tecnico, Av. Rovisco Pais, 1096 Lisboa Codex, Portugal.

* **July 18-21. 59th Annual Meeting of the Genetics Society of America.** San Francisco. Ms. Jean Francese, Genetics Society of America, 9650 Rockville Pike, Bethesda, MD 20814.

+ July 23-27. **4th International Symposium on Spatial Data Handling**; sponsored by International Geographic Union Commission on Geographic Information Systems. Zurich. Symposium Secretariat, Department of Geography, University of Zurich (Irchel), Winterthurer Strasse 190, CH-8057 Zurich, Switzerland (E-MAIL: K505820@CZHRZU1A.bitnet; FAX 41-1-257 4004). Workshops include: Spatial analysis using GIS; Map processing; software demonstration sessions.

* July 23-Aug. 11. **Chronostratigraphy of the Paleolithic in North, Central, East Asia and America (the Paleoecological Aspect)**. Novosibirsk, USSR. Academician A.P. Derev'anko, Institute of History, Philology and Philosophy, Siberian Branch of the A.S. of the U.S.S.R., Lavrent'ev Avenue 17, Novosibirsk-90, U.S.S.R. Deadline: 11/89. Choice of three excursions.

July 29-Aug. 2. **Ecological Society of America, 75th Anniversary Meeting**. Snowbird, Utah. Dr. Marjorie M. Holland, The Ecological Society of America, Public Affairs Office, 9650 Rockville Pike, Bethesda, MD 20814.

August

* Aug. 5-9. **41st Annual Meeting of the American Institute of Biological Sciences; with Botanical Society of America**. Richmond. Meetings Department, AIBS, 730 11th Street NW, Washington, DC 20002-4521 (202) 628-1500.

Aug. 6-9. **Annual Statistical Meetings**; co-sponsored by the American Statistical Association, the Biometric Society, and the Institute of Mathematical Statistics. Washington, DC. ASA, 1429 Duke Street, Alexandria, VA 22314-3402 (703) 684-1221.

Aug. 6-10. **17th Annual ACM Conference on Computer Graphics and Interactive Techniques (SIGGRAPH 90)**. Dallas. Lois Blankenstein, SIGGRAPH Conference Liaison, Association for Computing Machinery, 11 West 42nd Street, New York, NY (212) 869-7440; E-MAIL: lois.blankenstein@um.cc.umich.edu.

Aug. 12-16. **International Conference on Optics in Life Sciences**; sponsored by International Commission for Optics. Garmisch-Partenkirchen, FRG. G. von Bally, Laboratory of Biophysics, Institute of Experimental Audiology, University of Munster, Kardinal-von-Galen-Ring 10, D-4400 Munster, Federal Republic of Germany.

Aug. 12-18. **12th International Congress on Electron Microscopy**. Seattle. Dr. J.K. Koehler, University of Washington, Biostructure SM-20, Seattle, WA 98195.

Aug. 19-25. **20th Meeting of the Federation of European Biochemical Societies**. Budapest. 20th FEBS Meeting

Secretariat, Hungarian Biochemical Society, MTESZ, Budapest 1368, PO Box 240, Hungary.

Aug. 26-31. **Austceram '90**. Perth, Western Australia. Austceram '90, PO Box 515, South Perth, WA 6151, Australia (619) 474-1699; FAX (619) 474-1460. 13(1):16.

* Aug. 26-31. **200th National Meeting of the American Chemical Society**. Washington DC. Meetings Department, American Chemical Society, 1155 16th Street NW, Washington, DC 20036 (202) 872-4396.

+ Aug. 26-31. **Euroanalysis VII - European Conference on Analytical Chemistry**. Vienna. Prof. Dr. M. Grasserbauer, c/o Interconvention, A-1450, Vienna, Austria (43-222-2369-2647). Abstract deadline: 2/28/90. Session in Arts and Archeology: Scientific methods applied to the knowledge of the works of arts.

+ Aug. 26-Sept. 1. **13th International Association of Sedimentology Congress**. Nottingham, U.K. I.N. McCave, Department of Earth Sciences, Cambridge University, Downing Street, Cambridge CB2 3EQ, United Kingdom. Theme: Global environmental change. Sessions include: Glacial sediments through time; Man's influence on sedimentation.

Aug. 27-Sept. 1. **International Association of Hydrology, 22nd Congress; Symposium on Water Resources in Mountainous Regions**. Lausanne. Dr. A. Parriaux, Laboratory of Geology EPFL (GEOLEP), CH-1015 Lausanne, Switzerland.

Aug. 28-30. **IMACS European Simulation Meeting on Problem Solving by Simulation**. Esztergom, Hungary. A. Javor, Central Research Institute for Physics of the Hungarian Academy of Sciences, H-1525 Budapest 114, PO Box 49, Hungary. 13(1):17.

September

Sept. 3-7. **3rd International Symposium on X-ray Microscopy**. London. Dr. A.G. Michette, Department of Physics, King's College, Strand, London, WC2R 2LS, United Kingdom.

Sept. 3-8. **International Congress on Volcanology**. Mainz. G. Brey, Max Planck Institut fur Chemie, Abtl. Kosmochemie, Saarstrasse 23, 6500 Mainz, Federal Republic of Germany. 13(1):17.

Sept. 4-8. **World Archaeological Congress 2**. Cartagena, Columbia. Dr. Paul Reilly, IBM UK Scientific Centre, St. Clement Street, Winchester SO23 9DR, UK (FAX 44-962-84009; E-MAIL: WAC2@ECS.SOTON.UK). 12(4):11.

Sept. 4-8. **8th General Conference of the European Physi-**

cal Society. Amsterdam. L. Roos, FOM-Institute for Atomic and Molecular Physics, PO Box 41883, NL-1009 DB Amsterdam, The Netherlands.

Sept. 9-13. Large Lakes and Their Stratigraphic Record; Geological Society of America Penrose Conference. Lake Tahoe, California. Andrew S. Cohen, Department of Geosciences, University of Arizona, Tucson, AZ 85721 (602) 621-4691. 13(1):17.

+ **Sept. 10-13. African Geology, 15th Colloquium;** co-sponsored by CIFEG. Nancy, France. Marc Deschamps, Universite de Nancy 1, Laboratoire de Petrologie, BP 239, F-545006 Vandoeuvre-les-Nancy Cedex, France. Abstract deadline: 3/31/90.

* **Sept. 18-21. Annual Conference of the Remote Sensing Society: Remote Sensing and Global Change.** Swansea. M.G. Coulson, Department of Geography, University College of Swansea, Singleton Park, Swansea SA28PP, UK.

Sept. 18-23. 4th International Symposium on the Mesolithic of Europe. Leuven, Belgium. Pierre M. Vermeersch, Mesolithic Symposium, Redingen-straat 16bis, B-3000 Leuven, Belgium.

Sept. 20-24. 5th Nordic Conference on the Application of Scientific Methods in Archaeology. Stockholm. Arkeologiska Forskningslaboratoriet, Greensvilla, Stockholm Universitet, 10691 Stockholm, Sweden (08/162177; Bitnet: P396220QZCOM.BITNET. 12(4):10.

Sept. 23-27. Society of Exploration Geophysicists, 60th International Meeting. San Francisco. Convention Assistant, SEG, PO Box 3098, Tulsa, OK 74101.

* **Sept. 24-28. Past and Present Climate Dynamics: Reconstruction of Rates of Change;** convenors include Swiss Committee for the International Geosphere/Biosphere Program. Ticino, Switzerland. K. Kelts, ProClim90, Postfach 7613, CH-3001 Bern, Switzerland (41-21-2114; FAX 411-22-9164).

Sept. 24-29. 7th International Conference on Geochronology, Cosmochronology, and Isotope Geology. Canberra. Organizing Committee, IGOC7, Research School of Earth Sciences, Australian National University, Box 4, Canberra, ACT 2601, Australia. 13(1):17.

* **Sept. 25-27. The Linnean Society Annual Regional Meeting: The Present State of the Biosphere and Evolution.** Reading, UK. Dr. John Marsden, The Linnean Society of London, Burlington House, Piccadilly, London W1V 0LQ, UK.

Sept. 25-28. Symposium on Time and Environment; sponsored by the Department of Archaeology and the

Dating Laboratory of the University of Helsinki, and Group PACT. The Dating Laboratory, University of Helsinki, Snellmaninkatu 5, SF-00170 Helsinki, Finland. 12(4):10.

Sept. 29-Oct. 7. 6th Meeting of the European Geological Societies. Lisbon. MEGS6, Sociedade Geologica de Portugal, Apartado 2361, P-1109 Lisbon Codex, Portugal. 13(1):17.

October

* **Oct. 1-7. International Earth Sciences Congress on Aegean Regions.** Izmir. IESCA-1990, Dokuz Eylul University Department of Geology, P.K. 74 (E.U.-PTT), Bornova, Izmir, Turkey (51-182919; FAX 51-220978).

Oct. 7-12. 17th Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies. Cleveland. Charles J. Belle, Lucas Aerospace PEC, 4259 W. 192nd Street, Fairview Park, OH 44126 (216) 062-1001.

Oct. 8-12. 5th Australasian Remote Sensing Conference. Perth. Dr. Norman Campbell, Technical Paper Coordinator, 5th Australian Remote Sensing Conference, PO Box 411, West Perth, Western Australia 6005. 13(1):17.

Oct. 15-20. Association for the Study of Marble and Other Stones in Antiquity (ASMOSIA), 2nd Biennial Meeting. Leuven, Belgium. Norman Herz, Department of Geology, University of Georgia, Athens, GA 30602. 13(1):17.

Oct. 21-25. 2nd International Conference of Ethnobiology. Kuming, China. International Society for Ethnobiology, 2220 Piedmont Avenue, University of California, Berkeley, CA 94720. 13(1):17.

Oct. 21-26. Soil Science Society of America Annual Meeting. San Antonio, Texas. SSA, 677 S. Segoe Road, Madison, WI 53711 (608) 273-8080.

Oct. 29-Nov. 1. Geological Society of America Annual Meeting. Dallas. GSA Meeting Department, PO Box 9140, Boulder, CO 80301 (303) 447-2020.

November

* **Nov. 7-10. Southeastern Archaeological Conference.** Mobile, sponsored by University of South Alabama. Proposals by 8/31 to Edwin Jackson, Sociology/Anthropology, University of Southern Mississippi, Hattiesburg, MS 39406

* **Nov. 11-16. Eastern Analytical Symposium.** Franklin Township, New Jersey. EAS, PO Box 633, Montchanin, DE 19710 (302) 453-0785.

* Nov. 12-13. **2nd World Climate Conference.** Geneva. World Meteorological Organization, Ave Giuseppe Motta 41, CH-1202 Geneva, Switzerland.

Nov. 14-18. **American Anthropological Association Annual Meeting.** New Orleans. AAA, 1703 New Hampshire Avenue NW, Washington, DC 20009 (202) 232-8800.

Nov. 27-Dec. 2. **Materials Research Society, Fall Meeting.** David Sours, Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237 (412) 367-3003; FAX (412) 367-4373.

December

Dec. 2-9. **20th International Ornithological Congress.** Christchurch, New Zealand. Ben D. Bell, Secretary-General, XX International Ornithological Congress, Zoology Department, Victoria University, Private Bag, Wellington, New Zealand. 13(1):18.

Dec. 3-7. **American Geophysical Union Fall Meeting.** San Francisco. AGU Meetings, 2000 Florida Avenue NW, Washington, DC, 20009 (202) 462-6900.

* Dec. 27-30. **Annual Meeting of the American Society of Zoologists; also the American Microscopical Society.** San Antonio. Mary Adams-Wiley, American Society of Zoologists, 104 Sirius Circle, Thousand Oaks, CA 91360 (805) 492-3585; FAX (805) 492-0370.

1991

* **January 9-13. Society for Historical and Underwater Archaeology.** Richmond. L. Daniel Mouer, Program Chair SHA '91, Archaeological Research Center, Box 2040, Virginia Commonwealth University, Richmond, VA 23284. Session and abstract deadline: 5/31/90. Program theme: World System/World Views.

* **February 11-14. Fourth Australian Archaeometry Conference.** Canberra. Dr. Barry Frankhauser, Archaeometry Conference, Prehistory Department, RSPacS, The Australian National University, GPO Box 4, Canberra ACT 2601, Australia. FAX: 062 571893; BITNET: THL410@CSC.ANU.OZ.

May 20-24. **14th International Radiocarbon Conference.** Tucson. Dr. Austin Long, Department of Geosciences, University of Arizona, Tucson, AZ 85721 FAX (602) 621-2672; BITNET: C14@ARIZRVAX). 12(4):10.

July 7-11. **47th International Conference of Americanists.** New Orleans. Secretariado ICA 1991, Roger Trayer Stone Center for Latin American Studies, Tulane University,

New Orleans, LA 70118-5698.

Aug. 2-9. **13th INQUA International Congress on Quaternary Research.** Beijing. Secretariat, 13th INQUA Conference, Chinese Academy of Sciences, 52 Sanlihe, Beijing 100864, People's Republic of China.

Aug. 18-23. **International Symposium on Engineering Geology in a Desert Environment, Rock-Water Interaction.** Jerusalem. The Secretariat, International Symposium on Engineering Geology in a Desert Environment, Rock-Water Interaction, PO Box 50006, Tel Aviv 61500, Israel. 13(1):18.

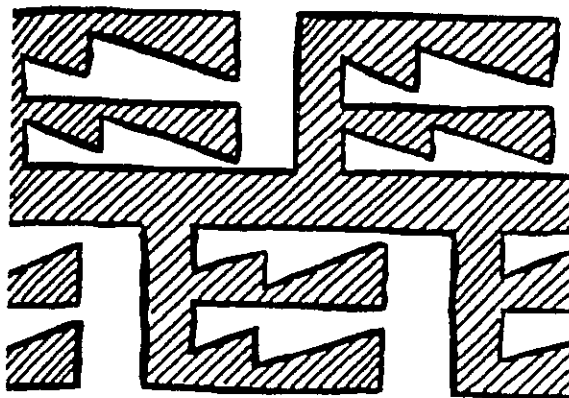
Aug. 26-30. **12th International Mass Spectrometry Conference.** Amsterdam. RAI Organisatie Bureau Amsterdam, Europaplein 12, NL-1078 GZ Amsterdam, The Netherlands.

Sept. 1-7. **International Union of Prehistoric and Protohistoric Sciences, 12th Congress.** Bratislava, Czechoslovakia. Archeologicky stav Slovenskij Akadmie Vied, Sekretarit XII Kongresu UISSP, 949 21 Nitra-hrad, Czechoslovakia. 12(4):4.

Sept. 6-11. **Paleoecology, 2nd International Congress.** Nanjing. Ma Yu-Ying, Nanjing Institute of Geology and Palaeontology, Academia Sinica, Chi-Ming-Ssu, Nanjing 210008, People's Republic of China.

Oct. 6-11. **8th International Congress on Human Genetics.** Washington, DC. John J. Mulvihill, M.D., Secretary-General ICHG, 9650 Rockville Pike, Bethesda, MD 20814.

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