

# SAS Bulletin

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### From the Editor(s)

After four years of editorial duty with the *SAS Bulletin* (and *SAS Newsletter*), I am happy to pass on responsibility to Rob Sternberg. I'm sure that his energy and fresh perspective will serve us well. This job has been a mighty challenge and an experience I won't soon forget. I'll take advantage of this last opportunity to thank the contributors who have made growth in the publication possible, and made my tasks enjoyable.

Patrick Martin



I look forward to taking over the editorship of the *SAS Bulletin* with both excitement and trepidation. Excitement, because I believe the SAS is one of the leading organizations in providing a forum for archaeometry. Editing the *Bulletin* will allow me to play a role in the work of our group and the development of our relatively young discipline. Reaching our colleagues in archaeology, biology, chemistry, geology, materials science, metallurgy, physics, and quantitative analysis is a challenge, but a job well done brings the satisfaction of weaving a strand of unity from these related but all too often separate threads. But trepidation, trying to understand enough of these disparate fields to do them all justice. And practically, meeting deadlines is hard enough when it is just your own work involved, but now I must see to it that you contributors meet your deadlines so that I can make mine.

I hope to devote my time for the next few issues to learning the art of desktop publishing, how to work with a printer, and how to carry out a mass mailing. The excellent efforts of my predecessor, Pat Martin, with whom I have greatly enjoyed working, provide a *Bulletin* model that I will initially follow. But the success of a *Bulletin* ultimately depends on contributions. We will continue with the Meetings Calendar assuming we find a new associate editor willing to spend a couple of days per quarter to assemble it. Any volunteers? The laboratory profiles and research reports provide a means to communicate methodological advances and where they are being carried out. Book reviews guide us through the plethora of published literature. I will expect regular, probably biannual, reports from our other



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## Book Reviews

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*Fishes*. ALWYNE WHEELER and ANDREW K.G. JONES. Cambridge University Press, Cambridge, 1989. xiv + 210 pp., illus., biblio, index \$59.50 (cloth).

*Reviewed by E. J. Reitz, University of Georgia.*

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*Fishes* is the most recent volume in the *Manuals in Archaeology* series published by Cambridge University Press. The series is intended to provide reference books for professional archaeologists and scientists in related fields. Each book in the series includes a survey of current archaeological practices as well as reference material on contemporary techniques and methodology intended for an international audience. Previous volumes have addressed data processing in archaeology, photography in archaeology and conservation, archaeological illustration, and soils. Simon Hillson's *Teeth* in this same series has been well received by zooarchaeologists and it is anticipated that *Fishes* will quickly be found alongside it on the shelves of most faunal laboratories.

Wheeler and Jones argue that fishes and fishing have had an important role in human economies. They must emphasize this as most archaeologists seem to feel that because they cannot see fish around the site or among the animal bone as readily as they might spot a deer or cow, that there are no fishes in their archaeological assemblages. It is still considered acceptable by many editors for papers to provide precise details about mammal remains but simply to note in passing that fish were present. Fishing is often assumed to have been an insignificant part of the economic activity at a site. Wheeler and Jones reason that fish have been neglected for so long because there are few people who can study fish bones because of lack of comparative skeletal collections and training, because fish bones are small and fragile, and because archaeologists are unaware of the interesting information about human diet, the economy of a settlement, and the environment of the site which can be gleaned from fish remains. In this volume they hope to demonstrate that fishes can yield important insights into human behavior when properly studied and to provide some of the information needed to begin such studies.

For beginners, one of the mystifying aspects of fishes is the diversity of taxa to be learned and a complex taxonomy compared to mammals. Wheeler and Jones set out to help beginners by discussing general rules of classification of fishes and by summarizing those fish orders which are

most relevant to zooarchaeologists. This very useful summary is accompanied by illustrations. From this side of the Atlantic one might argue that a list that excludes grunts and barracuda has been too exclusive; however it is a good place to start familiarizing oneself with the diversity of fishes found in archaeological sites.

The third chapter is brief but helpful. In it important aspects of fish ecology as they pertain to human use of fishes are reviewed. These include a discussion of trophic levels and faunistic zones. Both of these aspects of fish ecology are important to the interpretations of fish remains from archaeological sites, yet they are generally poorly understood.

Perhaps one of the most common reasons that fish have not been recognized archaeologically as the important resource they were is that inappropriate methods of recovery have been employed by many archaeologists. Wheeler and Jones discuss this problem and provide illustrations to demonstrate the impact of recovery technique on the recovery of fish remains. They also discuss sampling strategies and sieving approaches, providing such basic information as an equipment list required for collecting what they call soil sample, but which in North America would probably be called a column sample. Zooarchaeologists are well aware that fine screen recovery techniques not only increase the amount of fish remains recovered, but increase the amount of time/money required for a complete study. Some have decided to take subsamples of the excavated area. Wheeler and Jones argue, as others have argued previously, that one should sample by studying only those bones which are found to be most useful for identification rather than identifying all fish elements to some taxonomic level. This is a controversial recommendation and one which is likely to result in considerable discussion.

Chapters 6 and 7 survey the bone anatomy of agnathans, cartilaginous fishes, and bony fishes. The discussion is accompanied by detailed illustrations which are clearly labeled in most cases. While the illustrations are quite nice and will be useful to beginners it is in these chapters that the northern Atlantic orientation of the authors is most pronounced. The fishes selected for illustration and discussion are almost exclusively members of the cod family (Gadidae). While members of this family are common in archaeological sites from the northern Atlantic, the skeleton of this order is not as typical as that of fishes found in one of the larger and more abundant Perciformes families. This section is concluded with a discussion of the diverse names given to fish bones. Although it is unlikely that many zooarchaeologists will agree in full with the list of names provided by the authors, beginners will at least be able to take comfort in the clear statement that agreement

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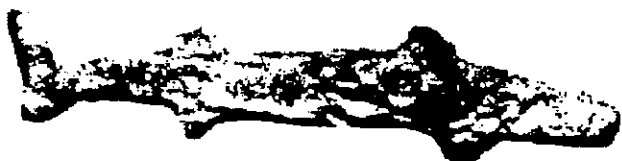
has not been achieved in this area. Ready access to such a list may facilitate development of a consensus eventually.

Chapters 9-12 of the volume address specific analytical problems: estimation of fish size, estimation of minimum numbers of individuals, estimation of season of capture, and interpretation of fishing activity. While the authors argue that drawing extensive conclusions from such analyses should be done cautiously owing to taphonomic biases, their survey of the literature on these topics indicates that fresh and innovative interpretations may be provided by fish remains from archaeological sites. These pages provide a wide range of stimulating critiques and comments.

Additional useful information is provided in other chapters. In Chapter 5, a series of illustrations shows what happens to fish vertebrae when digested by a dog and a rat, and another series illustrates what happens when fish vertebrae are masticated by humans. Readers trying to develop a computer system for recording fish remains will find the discussion of the Environmental Archaeology Unit's system in Chapter 8 helpful. In Chapter 13 Wheeler and Jones emphasize that there is no substitute for a good comparative skeletal collection and provide useful information about how to begin assembling a reference collection.

Beginners should be aware that some of the authors' technical recommendations are not ones with which all zooarchaeologists would agree. In a field where intersite comparisons are restricted because there is so little agreement among workers on nomenclature and fundamental procedures, recommendations that only a restricted list of bones might be identified (p. 58-59) or that measuring points might be defined pragmatically and vary from site to site (p. 140) should be read with caution.

However, the benefits of having this much information on fishes readily available in a small, handy volume outweigh these technical disagreements. This will be a very useful book to a great many people. It provides a convenient reference for much information on fishes which until now has been available primarily in widely dispersed sources. It must be hoped that the ready availability of this information will encourage more archaeologists and zooarchaeologists to consider fish remains an important part of the archaeological record.



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*The Beginning of the Use of Metals and Alloys. Papers from the Second International Conference on the Beginning of the Use of Metals and Alloys, Zhengzhou, China, 21-26, 1986.* ROBERT MADDIN, ed. MIT Press, Cambridge, Mass., 1988. 393 pp., index. \$55.00 (cloth).

*Reviewed by Martha Goodway, Conservation Analytical Laboratory, Smithsonian Institution.*

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This volume is as nearly encyclopedic as the state of archaeometallurgy will allow. It was intended to be the proceedings volume of BUMA II, the "Second International Conference on the Beginning of the Use of Metals and Alloys," held in China in 1986 as a direct result of the success of BUMA I, which had been held in Beijing in 1981 and which attracted a large Chinese participation. Certain names are conspicuous by their absence from the present volume, presumably due to the great cost of travel to China. It contains three papers from the earlier meeting, but only one invited paper from the Chinese participants. According to the editor's preface translations were not available. Given the number of Chinese-speaking Americans, it is evident that there were other problems in preparing this volume, as indeed there must have been in organizing the two conferences. This was done jointly by Professor Maddin and his old friend, Professor Ko Tsun of the Beijing University of Iron and Steel Technology, to both of whom we owe thanks for opening the scholarly discourse in archaeometallurgy with the Chinese.

The subject matter of this volume includes ore deposits and mining, early metallurgical operations, ancient alloys and alloy development, the development of early iron and steel, and techniques used in their study. The chapters range from magisterial reviews of early metals such as Moorey's on Mesopotamia and Muhley's exhaustive one on the Middle East in general, to site reports summarizing single excavations. Some report recent work such as Hosler's dissertation research on West Mexican bells and tweezers, to others such as the chapter by Notis on Japanese *shakudo* (from BUMA I) which represent fully mature statements. The areas covered include Eastern Europe and Balkans, Scandinavia, and the Far East as well as Meso- and South America (one chapter by Lechtman) and Africa. The coverage is generally representative of the unevenness of archaeometallurgical studies at present, and as such this can be taken as a benchmark volume.

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It is the first such compilation since *Early Pyrotechnology, The Evolution of the First Fire-Using Industries*, published in 1982 (Theodore A. Wertime and Steven F. Wertime, editors, Smithsonian Institution, Washington DC) and like that volume belongs in the working library of every archaeometallurgist. Unlike the furnace volume (*Furnaces and Smelting Technology in Antiquity*, edited by P. T. Craddock and M. J. Hughes, British Museum Occasional Paper No. 48, London 1885), which included work in progress and noted subjects for future study, the BUMA volume appears more retrospective. It is not user-friendly. Not all figure labels are in English. There is an index, but there is no cross referencing between chapters. For example, the important seventh millennium native copper awl from Tell Magzallia mentioned by Moorey (p. 29) is illustrated by Muhley (Fig. 1.6, p. 8) without cross reference, and it is also without an index entry.

There are no summaries of the discussion following the papers. Commentary by the editor would have been welcome, especially on questions of emphasis and interpretation, and it is here also that we feel the lack of the Chinese contributions most keenly. For example, cast iron, whose early exploitation is unique to China, is the subject of a chapter by Rostoker. His interpretation of its influence is essentially one of technological innovation driving social and economic change, and begs for alternative interpretations. The texts were not edited to a standard terminology: 'families' of tools (p. 63) should perhaps be assemblages; 'single-sided' and 'double-sided' molds (p. 78) should be called open-face and bivalve if that is what they are; and howlers such as lead to harden copper (p. 78) should be avoided. This is not a book for the unwary reader, which is a pity because much of the material presented is not easily available elsewhere.

### EDITOR'S NOTE:

*During the transition period at the beginning of the Book Review Editor's term, a bit of confusion (regrettable, but perhaps inevitable) ensued, resulting in reviews being solicited from two individuals for the same book. As a result, Rob Sternberg's review of Leute's Archaeometry follows an earlier review of the same book by Joseph Lambert [see SAS Bulletin 13:1 (1990)]. We regret the duplication . . . and also the fact that this apology will have to appear again in a future issue.*

*Current Scientific Techniques in Archaeology*. P. A. PARKES. St. Martin's Press, 1986. 271 pp. \$35.00 (cloth).

*Archaeometry. An introduction to Physical Methods in Archaeology and the History of Art*. ULRICH LEUTE. VCH Publishers, Weinheim, FRG, 1987. xi + 176 pp., index. \$26.50. (cloth).

*Reviewed by Rob Sternberg, Franklin and Marshall College.*

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These two relatively new books dealing with general aspects of archaeometry are timely. It is my general impression that the field of archaeometry has shown some growth spurts in the last few years, as evidenced by the development of new techniques, improvement and extended application of established methods, the formation and growth of groups such as our own, conferences in different parts of the world, and a growing literature. The classic general references in archaeometry, such as *Science in Archaeology* (Brothwell and Higgs, 1969), *Methods of Physical Examination in Archaeology* (Tite, 1972), and *Physics and Archaeology* (Aitken, 1974), are now over 15 years old. Some of the more specialized books, e.g., *Thermoluminescence Dating* (Aitken, 1984), *Archaeological Geology* (Rapp and Gifford, 1985), and *Radiocarbon Dating* (Taylor, 1987), are of a more recent vintage. The specialist also has several volumes of conference proceedings and many journal pages to peruse, but for those seeking an introduction to the field as a whole, the two books reviewed here provide potential starting points.

*Current Scientific Techniques in Archaeology* by Parkes is well organized. It begins with useful lists of units and abbreviations/symbols, which are not only helpful to the archaeologist, but to almost any of us reading beyond our fields of specialization. The table of contents would have been better if the chapter sub-headings were included. There is no list of figures. The breakdown into the ten chapters is quite reasonable: an introduction, four on dating (C14, thermoluminescence, archaeomagnetism, and "other"), three on analysis (isotopic studies, chemical analysis, and other analytical techniques), one on prospecting, and one on computers (which, not surprisingly, has not aged very well in terms of the discussion of hardware and software,

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even in the few short years since publication). Two tables at the end of the book on the various analytical and dating techniques provide a useful, abbreviated summary of what has been described in more detail in the text. A selective list of labs is indeed selective, but should serve as a starting point for the archaeologist seeking an archaeometric specialist. The index is adequate.

The length of the book is reasonable for a textbook or an introduction to the field, although an extra 100 pages, which would have made the length similar to that of Tite's book, would also have enabled it to be more comprehensive. About 300 references, the large majority of which were published since 1980, are included as endnotes for the relevant chapters. The chapter references are preceded by suggestions for further general reading in the subject matter of that chapter. The older classic references mentioned above are not cited, and I was surprised to see no reference to Libby, who after all won the Nobel Prize for his work on radiocarbon dating. The references are weighted heavily toward work in the U.K. and Europe, and toward the journals *Archaeometry*, *Journal of Archaeological Science*, and the *Bradford Archaeometry Symposium*. Overall, however, the references provide a helpful guide to various research papers on applications of the techniques described.

The introduction sets out the goals of the book, to which Parkes does indeed adhere throughout. Immediately we are told that "the book provides an introduction and guide to techniques derived from the physical and chemical sciences for archaeologists with little or no scientific training: in short the field of archaeometry." Thus we know both the scope of the book and the intended audience. Some topics more explicitly biological and geological are excluded, but one soon realizes how fuzzy such distinctions can become. Although radiocarbon and archaeomagnetism, for instance, are techniques that rely on principles of chemistry and physics, they are largely done by people in geoscience departments, where dendrochronology and pollen analysis are also often done. Given the length of the book, the demarcations chosen are at least consistent. In speaking to the archaeological audience, Parkes structures each chapter in a similar fashion. The potential of the technique is summarized; I found these sections to be quite good. Underlying principles necessary for understanding the technique are outlined, with particular attention given to common problems which affect the results. Details of lab procedures are omitted in that these are generally not of great interest or benefit to the archaeologists, who most often (but not always!) are not the actual archaeometrists but are the users of the archaeometric results. Chapters conclude with examples of applications, sometimes I wished these were a bit more substantial, but they adequately indicate the scope and

limitations of the various methods. The writing style is clear and readable throughout, with few equations. Several analogies are used which add a touch of lightness while at the same time illuminating some of the potentially difficult scientific principles. For example, in explaining the principles of spectroscopy, occupation of electron shells is compared to occupation of apartments in a high-rise building—the lower energy levels (floors) are preferred for reasons of energy. Diagrams are illustrative of the principles underlying the methods (but are physically often rather large for the amount of information contained); more figures of actual results would have been useful. No photos, such as those which enhance Tite's books, are included.

Parkes makes several important points in the introductory chapter which she comes back to during the course of the book. First, archaeologists should be clear about the information desired from a particular archaeological study, and pose the correspondingly proper question to the archaeometrist. Second, communication of goals between archaeologist and the archaeometric specialists minimizes confusion and maximizes useful results. Third, proper information on the sample should be provided. Fourth, whatever useful information possible should be provided to the archaeometrist. And last, archaeologists should also cooperate to advance the research of the archaeometrists because of the reciprocal goals and benefits to their respective disciplines. My experience as an archaeomagnetist certainly suggests that use of these five principles would do far more to promote quality archaeomagnetic work than the oversimplified question, "What is the archaeomagnetic date?" Their emphasis throughout the book is welcome.

Among the other points in the book which are noteworthy for their simplicity and import are: the distinction between dating accuracy and precision (p. 25); the importance of dating an event of real interest or utility (p. 41, 99); the nonuniqueness and pattern-dependence of archaeomagnetic directional dates (p. 61); the utility of archaeomagnetism for relative as well as absolute dating, and for non-chronometric problems (p. 93-95); the distinction between absolute and relative chemical compositions (p. 177); the potentially different roles that geophysical surveying can play (p. 206); the effect of rainfall on electrical resistivity (p. 213); the interference of geophysical noise from geological and modern cultural sources with the archaeological signal (p. 215); the paucity of published geophysical survey data, relative to the amount of work that has been done (p. 227); sample requirements for the various types of analyses.

I do have some argument with occasional choice of wording and points that are made, but this is to be expected, and

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a different list could be drawn up by each archaeometrist. For example, I don't think that calibration of radiocarbon dates move it from the class of absolute to relative dating methods (p. 11). Figure 2.3 is misleading in suggesting that the individual uncertainties on replicate C14 analyses will be identical. The Earth's magnetic field is indeed largely dipolar, but it is not due to a bar magnet (p. 62; Fig. 4.1). Geomagnetic secular variation refers to changes in the dipole as well as the nondipole field, not just the latter (p. 63). Although dating errors of  $\pm$ [+ over -]20 years for archaeomagnetic directions (p. 76) and  $\pm$ [+ over -]25 years for intensity (p. 89) may indeed be possible under the best of circumstances, my own opinion is that his optimism is almost always unwarranted. Apparent resistivity, not electrical resistance, is measured in an electrical survey (p. 210). Magnetic surveys should be aborted during magnetic storms; archaeological signals will generally be obscured, and even attempts at correcting for the storm (p. 215) will be fruitless. Ground-penetrating radar and electronic distance meters, bound to become quite important in geophysical surveying, are omitted. The concept of a computerized "database" is discussed (p. 247), but this important keyword is not used. But points such as these are for the most part details in relation to the whole; in general the text is technically accurate, and should serve to properly educate a novice to the field.

There are the unavoidable typos (to show that I have really done my reading), which even our spelling checkers cannot find: the format of the Radiocarbon table (p. 17) obscures the meaning; references 15 and 16 in chapter 3 are reversed; the spread of "framing" (pictures?) in the Neolithic (p. 30) sounds a bit premature, so probably should refer to farming; British "Mancetter" (p. 65) undoubtedly refers to Manchester; the intensity scale in Fig. 4.4 should be in units of 10<sup>-6</sup>, not 10<sup>6</sup>; the Brunhes-Matuyama boundary is incorrectly shown as older than the Jaramillo event in Fig. 4.9 (although correctly located at 0.73 Ma in the text); 10 hours of fission-track counting are required to obtain a one sigma error as low as 10% of the age, not to date the sample at the one sigma level (p. 113); the reference numbers in chapter 6 do not match those in the notes; the name "Freeston" is missing a final e (ref. 3, p. 178), and Maniatis is also misspelled (p. 188, 196, 198); the date for reference 4, chapter 5 (p. 126) should be 1981.

The organization of Leute's book *Archaeometry - An Introduction to Physical Methods in Archaeology and the History of Art* bears some similarities to Parkes'. Both the prefaced and introductory chapters contain some general comments. The breakdown into chapters is more general, with only four beyond the introduction: prospection, dating, characterization, and mathematics and computers. Two levels of subheadings are used within the chapters, and it is useful to find these in the table of contents. Again, there

is no list of figures. An appendix on units is included at the end of the book, but many are in fact excluded since "most units are familiar to the educated reader," although this is not clearly the case. Nonstandard expressions are used for units - the quotient A/m, for example, rather than A m<sup>-1</sup> and Leute occasionally gets into trouble by not using parentheses for more complicated units involving numerator and denominator. The index contains more of the acronyms than does Parkes', so that one can find SEM without knowing what it stands for, but the omission of carbon-14 or C14 will cause some confusion to the reader not aware of the equivalent term radiocarbon, which is indexed.

The book has only 176 pages, which really is quite short. Many of the same topics are covered as in Parkes' book, so there is obviously some abbreviation. There are 116 references at the end of the book, divided into general references (37) and further references (69). The general references do include most of the classic books in the field, but also some rather unimportant papers, dealing with the greenhouse effect, for instance. The further references mostly involve applications of the various techniques, but the selection is a bit slim and somewhat idiosyncratic. There are too many occasions in the text when results are alluded to, but for which the references are not provided. Unlike Parkes' volume, there are no references at all to articles from conference proceedings, such as the Archaeometry Symposia. The reference style is variable. The English and German literature are both represented. A list of journals in which archaeometric articles are found will help the newcomer to the field find additional literature.

The scientific disciplines emphasized are physics and chemistry in that order, with a lesser amount of attention paid to quantitative methods emanating from biology and geology. Applications are explicitly made to problems in the history of art, as well as to archaeology. The preface correctly states that despite the progress in archaeometry, there can still be a lack of appreciation by the archaeologist (read classicist in Europe) of what physics and chemistry can do for archaeology, and also of the potential archaeological applications of the tools that the chemist and physicist possess. Leute thus directs the book at both groups, and also states that most of the book is "devoted to the attempt of elucidating the physical principles underlying archaeometric methods." Here are the origins of some of the qualms I have about the book. Both groups, the archaeologists and the natural scientists, can indeed benefit from increased knowledge of the various archaeometric techniques and applications. Yet Leute occasionally seeks to satisfy primarily the natural scientists with a more detailed explanation of theory, methodology, or instrumentation. The discussion of the proton precession magnetometer, and the accompanying Figure 2-5, is a case in

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point. The details presented here are essentially irrelevant to understanding the utility of this prospecting technique, yet the practicalities of how an actual survey is conducted are not discussed. Although we learn why readings taken with this instrument are not continuous, the typical cycle time (about 5 s) is not given. The physicist interested in such detail can find it in any of several excellent books on exploration geophysics. Graphs could complement or replace some of the equations and text, e.g., equation 2.3 on the magnetic field due to a magnetized dipole. The archaeologist is sometimes warned that sections of the book can be skipped by those not interested in the beauty of physical theory and mathematics, but I think that such material would be better omitted. Such a warning is used in the chapter on characterization, where one section focuses on the applications of the various methods, and following sections focus on the theory of the different methods. This approach tends to divorce theory from application. Thus I do not agree that in this book "The usage of technical terms and professional language on both sides has been kept to a minimum." As Leute claims, the list of physical methods is indeed relatively complete, and the principles and applications for each method are sketched. I think, however, that a book with greater focus on general principles and applications would be more useful for both audiences than such a list.

It is clear that this book is written by someone whose native language is not English. As someone trying to learn German this year, I admire anyone who can speak or write in a second language. Although the book's English is generally grammatically correct, it is often nonstandard, and can be disconcerting. There are many typos, misspellings, and hyphenation errors. I was also annoyed by the number of single-sentence paragraphs. Although I can understand how some of these errors can occur when one is writing in a second language, I cannot understand why a publisher would not seek proper editing to smooth out the writing. Among the more disturbing typos/errors: archaeometry is misspelled (p. 4); units of gravity are given as  $m^2/s$ , twice (p. 11); susceptibility is repeatedly (but not always) spelled "susceptability," which is not even correct in German; varves are consistently spelled as "warves," which at least is the German spelling; units of solar particle flux should be 10 per  $cm^2$  per second (per second is omitted, p. 17); the caption to Fig. 3-4 states that one standard deviation defines the half-width of the Gaussian curve, but it defines where the probability curve falls to  $1/e$  of its maximum, as Leute's equation 3.3 implies; the caption to Fig. 3-5 indicates the ordinate is  $M(H_c)$  but it should be  $M(H)$ ; the ordinate axis to Fig. 3-10 should be labeled as  $B$ , not  $H$ ; the Thellier method is used to determine the paleointensity of a sample, not its TRM (p. 58); the time required for the Thellier experiment is not three hours, but on the order of a month (p. 59); the reference to Fig. 3-18 in

the middle of p. 77 should be to Fig. 3-20;  $N_{10}$  in equation 3.22 should be  $N_0$ ,  $5.10^{22}$  should be  $5 \times 10^{22}$  (p. 80); Libby's basic assumption concerning "zero time concentration" of atmospheric C14 should read something like "zero variation with time" (p. 83); the term "glass-house" effect is used instead of greenhouse (p. 86; maybe we can solve this environmental problem if we don't throw stones!); lava is not a mineral, and since it is molten it cannot be dated by K-Ar in any case (p. 88); potassium is a major element, not a trace (p. 88); three different spellings are used for Moessbauer (acceptable) in the text, Mössbauer (preferred) in figure captions, and Musssbauer (wrong) in the caption for Fig. 4-12. A spelling checker was clearly not used on this manuscript. Leute obviously has a good sense of humor as revealed in an occasionally breezy style or joke (regarding TL saturation, "it is hoped that this does not reflect the state of a reader troubled by too many physical details"), although I wonder if the student will always understand the humor as such. Like Parkes, he also uses some helpful analogies, such as the clock analogy for dating methods. The illustrations focus on physical principles and instrumentation, with fewer concerning results. The photographs of sites, artifacts, and objects of art are a nice addition.

Again, I think it is worth enumerating some of the points Leute makes that might have been omitted, but thankfully were not: appropriate words of caution are issued early on in the preface—"not all possible methods are necessarily practicable ones in a special case, be it only for the limitation of funds..." (although other limitations are not stressed enough in the text); the applications to art history are a nice addition; the history of "archaeometry" is interesting but too brief, and the statement that the term "archaeometry" must be older than the 1958 origin of the journal of that name is wrong, according to Taylor and Payen (in M.B. Schiffer, *Advances in Archaeological Method and Theory*, V. 2, 1979, p. 241); comments on how an archaeologist knows where to dig, and various possible goals of geophysical survey (p. 5); inclusion of ground-penetrating radar, aerial, thermal, and underwater prospecting methods (although the EDM is again omitted); the reminder of the disturbing effects of magnetic noise from modern cultural features (p. 17); dating of historical (classical) materials (p. 37-38), and different classes of dating methods (p. 39-40); discussion of how the various "clocks" work (sec. 3.1.2); treatment of statistical outliers (p. 44); the summary Table 3-2 of dating methods; general comments on sourcing and trade routes (p. 100-101); the need for an engineer rather than a scientist to tackle certain problems, such as how the stones for megaliths are moved (p. 104); the section on style and authenticity, and the comment on the importance of subjectivity, supplemented by technical analyses, in these areas (p. 107-110); the reminder of the utility of optical microscopy (p. 119); the classification (p.

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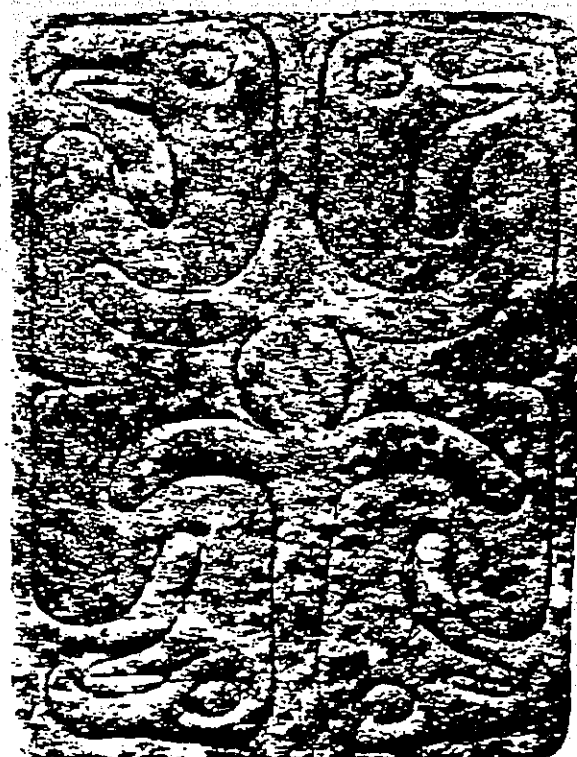
133-134) and summary Table 4-3 of analytical methods.

On the other hand, there are things I would have said differently, in addition, or correctly. There are references which may remain semi-obscure to either the archaeologists or the physical scientists, e.g., the references to Archimedes' work on density (p. 106, 125). Some contour and other maps resulting from geophysical surveys are shown (section 2.3.7), but no profiles, which for beginners are the simplest representations of survey results. Differences between electrical resistivity and resistance are ignored, as is the concept of apparent resistivity, and array geometries are not well explained (2.3.1, 2.3.2). Magnetic units are not well explained, considering the attention paid to the physics (2.3, 3.2). The magnetic moment due to a buried magnetized sphere will not point toward north or south (p. 16)—this depends on latitude, and approaches vertical at mid-latitudes. The statement that "our entire knowledge about crust, mantle, solid and liquid core stems" from seismology (p. 32) will cause other types of geophysicists to wonder if their work has been duly noticed. The geomagnetic event at Laschamp was detected in igneous rocks, not fireplaces as at Lake Mungo, Australia (p. 57). The example on sourcing of obsidian samples by neutron activation is one of the many uncited studies, and also suffers from poor statistics, with only two unknowns compared against two references (p. 101). The mathematics and computer chapter and the book end on an odd note. "But in spite of the euphoria sponsored by the microelectronics industry computers have to be classified as either essential, helpful, convenient or a costly nuisance" (p. 158). "One has to keep in mind that they are just as efficient as their programmers. Computers are to be regarded as potentially powerful but at the same time limited tools. Every encouragement should be given in setting people free from a slavish respect of computers, and in employing them casually, whenever the complexity of the problem makes a numerical processing by these machines advisable" (p. 159). Much of modern archaeometry would be impossible without the computer. Although it is true that garbage into the computer leads to garbage out, Leute's concluding statements could apply to the use of any high-tech method/instrument employed in archaeometry. One hopes that the reader of this book will come away from it with the good sense to realize this, and the ability to be sure that it does not happen.

The goals of these two books and the niches they hope to fill are similar enough that a final comparison is in order. Leute's book does discuss most of the physicochemical methods of archaeometry. Since it is now one of the few such books in the field, one would expect to find it in every research library. It could serve as an introduction to the field, but more easily for the scientist who would not be intimidated by the math and physics. I would recommend

Parkes' book as the better of the two, however. It is longer, much clearer and easier to read, better focused and more consistent in level of difficulty, and richer in the discussion of applications and references given. This book would make a good text for an introductory course in archaeometry, and would be a useful book for any archaeologist, or for archaeometrists who are less familiar with related fields outside of their specialties. The older books of Tite and Aitken have aged quite gracefully; it is surprising how many of today's techniques are already in these books, although some of the more recent innovations are indeed absent. The style and level of these books are hard to beat, but Aitken is out of print, and Tite is twice as expensive as Parkes. At least for a textbook, Parkes emerges as the winner.

Both of these books make clear that the field of archaeometry is perhaps most easily defined by the techniques that comprise the field, and the applications for which they are used. The question has been raised in the past as to who should ideally become an archaeometrist, the archaeologist or the physical scientist. After reading these books, I was quite curious as to the backgrounds and orientations of the respective authors. The books themselves gave little clue, either in biographical notes or in the references themselves, as to who the authors are or what their interests in archaeometry might be. In these cases, at least, we will have to let the results speak for themselves.





## News of Archaeometallurgy

There will be an international symposium on "Iron Paleometallurgy and Cultures" at the University of Technology of Compiègne at Sevenans in Belfort, France, 1-3 November 1990. It is being organized by P. Benoit and Ph. Fluzin under the auspices of the IUPPS Iron Committee, the Ministry of Research and Technology, the mining and metallurgical history group of CNRS, and the French Metallurgical Society. Simultaneous translation will be available. One day will be spent in site visits. Registration is 250 francs. For further information write Mme. Etienna Lesage, Secrétariat du Symposium, Université de Technologie de Compiègne à Sévenans, 90010 Belfort Cedex, France. Include your fax number.

An international symposium on "Goldsmith's Tools and Workshops Worldwide from the Vth Millennium BC to the XVIth Century AD" will be held 17-18 January 1991 at the museum in St. Germain en Laye in connection with the exhibition, "Early Gold Seekers, Early Goldsmiths," which is being held there between 26 October 1990 and 21 January 1991. The registration fee is 800 francs. For information write Christine Eluère, Coordinateur du Symposium "orfevre", Conservateur, Musée des Antiquités Nationales-B P 30, Chateau de, F78103 St. Germain en Laye, France. Please include your fax number.

A workshop on blacksmithing is being held 17-21 October 1990 at the Sloss Furnaces National Historic Landmark in Birmingham in connection with the Birmingham Blacksmithing Festival. It will be conducted this year by Peter Happny. Registration is \$100. For information write Sloss Furnace Association, Sloss Furnaces National Historic Landmark, First Avenue North at 32nd Street, PO Box 11781, Birmingham, Alabama 35202.

There will be an international symposium on "Ancient Jewelry and Archaeology" to be held at the Indiana University Art Museum in Bloomington 26-28 September 1991. It is being held in memory of Burton Y. Barry, and a selection of gold jewelry from the collection he donated to the museum will be on exhibition at the same time. For information write Ms. Adriana Calinescu, Curator of Ancient Art, Indiana Art Museum, Bloomington, Indiana 47405; Telephone (812) 855-1033.

The 1991 annual conference of the Historical Metallurgy Society has been set for 20-22 September 1991 in Glasgow.

Christiane Eluère's *Secrets of Ancient Gold* has been published in Switzerland. It has 260 illustrations in 240 pages, 110 of them in color. The book contains evidence from archaeology, documents and the laboratory and covers the techniques of alloying and refining as well as methods of fabrication and decoration. It can be ordered from Trio Verlag, Hauptstrasse 8a, P O Box 232, CH-3186 Dürdingen,

Switzerland, for 150 Swiss francs plus 9 francs for shipping.

Heinz Denig, an accomplished blacksmith, has written a book in German on pattern welding, its history and techniques, with 40 full page photographs, 9 in color, and 8 pages of diagrams. The title is *Alte Schmiedekunst, Damaszenerstahl* (Kaiserslauten 1990, 132 pp., ISBN 3-927754-04-8) and it can be ordered from the Institut für Pfälzische Geschichte und Volkskunde, Benzinning 6, Postfach 2860, 6750 Kaiserslauten, Germany, for 45.00 DM and 4 DM shipping, forwarded to post account CCP-Nr.4047-674 Ludwigshafen, Bank No. 54510067. If paid in dollars, 12.50 DM must be added for bank charges.

A new publication, *The Blacksmith's Journal. A Monthly Journal of Illustrated Techniques*, has been announced. It features step-by-step diagrams of blacksmithing techniques, projects, and plans for forges, etc. Subscriptions are available for \$28 per year (Canada \$35) or \$50 for two years, from Jerry Hoffman, Route 1, Box 189, Lonedell, MO 63060.

A new institute for the study of the history of metal production, the Institute of Archaeometallurgy, has been founded at the Bergbau Museum in Bochum. Its director is Andreas Hauptmann and it is receiving support from Volkswagen Stiftung. The purpose of the institute is to offer archaeologists analyses of metallurgical remains and to conduct research in early metallurgy. Research projects include early iron metallurgy in Germany, mining in Wadi Feinan, Jordan, the copper trade in the Near East, and the beginnings of metallurgy in the Pre-Pottery Neolithic.

Gerhard Sperl organized a course on archaeology and historical metallurgy of copper under the auspices of the Council of Europe at the European University Centre for the Cultural Heritage at Ravello, with roasting and smelting experiments at Lake Accessa, in May.

Martha Goodway, CAL MSC, Smithsonian Institution, Washington DC 20560 USA. Telephone (301) 238-3733; FAX (301) 238-3709

### *Goodway Named President of Historical Metallurgy Society*

*Martha Goodway was recently elected President of the Historical Metallurgy Society, an international group that publishes the journal Historical Metallurgy. Goodway has been widely recognized for her contributions to the historical study of metals and metallurgy, and is further notable as the first woman and first person from outside the U.K. to serve as HMS President.*

## Announcements

### Travel Grant Program XIII INQUA Congress Beijing, August 1991

The U.S. National Committee for the International Union for Quaternary Research (USNA/INQUA) is expecting to obtain funding for its travel grant program for the XIII INQUA Congress in Beijing, China, August 2-9, 1991 and related pre- and post-congress field excursions. This travel grant program is cosponsored by the American Geophysical Union. With the cooperation of the American Quaternary Association, the USNC/INQUA seeks to ensure appropriate U.S. representation by providing 20 to 30 travel grants for Quaternary scientists residing in the United States (regardless of citizenship) to participate in the activities of the congress. Travel grants, which will cover only a portion of the participant's expenses equivalent to airfare, are to be awarded competitively. Papers submitted for presentation at the congress will be evaluated, especially in light of their relation to the congress theme "Global Environmental Changes and their Relation with Anthropogenic Activities." The Awards Subcommittee will also give consideration to those judged to benefit most by participation in this important international event.

Travel grant applications and detailed instructions are available from:

*Pembroke J. Hart, USNC/INQUA - HA -460, National Academy of Sciences, 2101 Constitution Avenue NW, Washington DC 20418, Telephone (202) 334-3368 or 3306.*

**Deadlines: 1st:** Note that abstracts for inclusion in the congress must be received in Beijing not later than 1 December 1990. Abstract forms will be included with the travel grant application, as well as information on registration for the congress.

**2nd:** The completed application for a travel grant, including an extended abstract for your paper and a one-page curriculum vitae, must be received in Washington by 15 January, 1991.

**Stipulated requirements:** Grantees will be required to use U. S. flag carriers in accordance with government regulations and to file a meaningful trip report (emphasizing the benefits of attendance) within 60 days of the end of the congress.

**Grant announcements:** The committee aims to announce the travel awards by 15 February, 1991. However, some awards may be made later because of cancellations or delays in availability of funding.

### European University Center for the Cultural Heritage Ravello, Italy 1990-1991 Activities

The European University Center for the Cultural Heritage has announced a full program of activities for the coming year. A number of their seminars, round tables, symposia and films will be of great interest to SAS members. Among the major topical themes to be explored this year are "Analysis, Publication, Interdisciplinary Historical Studies, Paleocology, Cultural Tourism, International Patrimony, and Cultural Patrimony in High-Risk Zones." Within these thematic groupings are programs with such titles as "Technology and Analysis of Ancient Gemstones, Mediterranean Archaeoceramics, Life and Survival of Ancient Coins, Room Temperature Semiconductors, X and Gamma Ray Detectors, and Related Electronics, Graphic Arts for Archaeology, Men and Time Measurement, Ancient Commerce Without Archaeological Traces, Water Engineering in Antiquity, Laminated Sediment and Archaeology, Cultural Tourism, and Vulcanology and Archaeology."

For a complete listing of program offerings and details, contact:

*Eugenia Apicella, General Secretary, European University Center for the Cultural Heritage, Villa Rufolo, Ravello, Italy 84010, Telephone: 39 (0)89 857669, Fax: 857711.*

### *Additional Service to SAS Members*

The SAS is pleased to announce that it has made arrangements to accept additional international charge cards for charging membership/subscription costs. The cards now accepted by SAS are, in alphabetical order:

Access  
American Express  
Carte Blanche  
Diners Club International  
Eurocard  
Mastercard  
JCB Card  
Visa

Contact the General Secretary (R.E. Taylor) if you wish to take immediate advantage of your charge card to upgrade to Life Membership! Otherwise, you may use a card to renew at the end of the year.

## Sternberg is New Editor (Continued from p.1)

associate editors, and will consult with them over the possibility of renaming their departments so as to broaden the fields that they will cover.

I have some new ideas that I will be working on during the coming months. I hope to establish an electronic bulletin board for the exchange of information and ideas, and publish some of the more interesting correspondence. Jim Burton has already compiled a long list of E-mail addresses and research interests, which just today helped me to put a colleague at Texas A&M in touch with someone in Australia. Our membership list should be published as part of the *Bulletin* at least every two years, and should include E-mail addresses and research interests. I am formulating some ideas for a series of reports on the state of our profession, coming from academia, government, museums, funding agencies, and educators. I would hope to reach some of our colleagues abroad, perhaps through the tentacles of our E-mail networks, and entice contributions on the state of archaeometry in various regions and countries.

Ideas from all of you are welcome. This is your *Bulletin*. Only your contributions can keep it going, and your ideas can keep it vibrant.

Rob Sternberg, Department of Geology, Franklin and Marshall College, P.O. Box 3003, Lancaster, PA 17604-3003. Phone: (717) 291-4234; BITNET:R\_STERNBERG@FANDM.

## Associate Editor for Meetings Calendar Needed!

Since Rob has taken on the General Editor's job, we need someone to take over generation of the "Meetings Calendar." This important feature of the *Bulletin* requires the attention of an individual who wishes to serve our membership while keeping on top of current meetings. The "Meetings Calendar" has consistently been a focus of positive comment from the readership, and we are anxious to continue this service at a high level of quality.

Rob suggests that the job requires about 2 days of effort per quarterly issue. Access to a good library with periodicals from several disciplines is essential. On-line connection via BITNET is a definite plus; Rob submitted his contributions as electronic manuscripts each quarter, thereby eliminating duplication of keyboard entry.

Anyone interested in serving the SAS in this capacity should contact Rob as soon as possible.

## "Modern Tools in Archaeometry"

A SAC Symposium  
Gothenburg, Sweden  
May 23 - 25, 1991

This symposium will be held at the Chalmers University of Technology, and is to be supported by the Nordic Culture Foundation. The theme of the Symposium is modern methods in archaeometry, broadly defined to include a number of research fields: analysis, astronomy, data handling, dating, imaging techniques, metallurgy, monuments, osteology, paleobotany, prospecting, technology, treatment procedures and underwater archaeology.

Dr. Svante Pääbo, University of California - Berkeley, has been invited to give an introductory lecture on DNA and archaeology. The program will also include regular paper sessions, a poster session, a demonstration of the University's SIMS (secondary ion mass spectrometry) instrument, a reception, dinner and site excursion. If you wish to offer a paper or poster, or simply attend the Symposium, contact the organizers at the address below before December 1, 1990.

Abstracts will be distributed at the Symposium. Camera-ready abstracts should not exceed 1 A4 page, double-spaced, with 25mm margins. If possible, use CGTimes PC 12 point font. The deadline for abstracts is April 30, 1991.

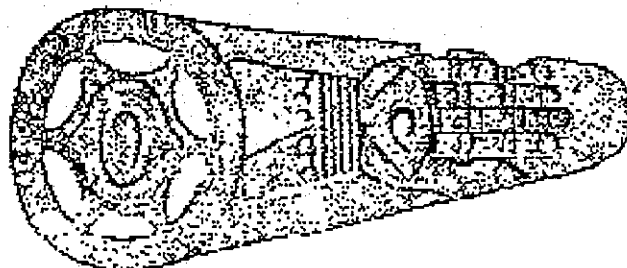
Hotel prices in Gothenburg are at present approximately \$70 - 200(US) per night without breakfast for single room. Lodging in a youth hostel is also possible.

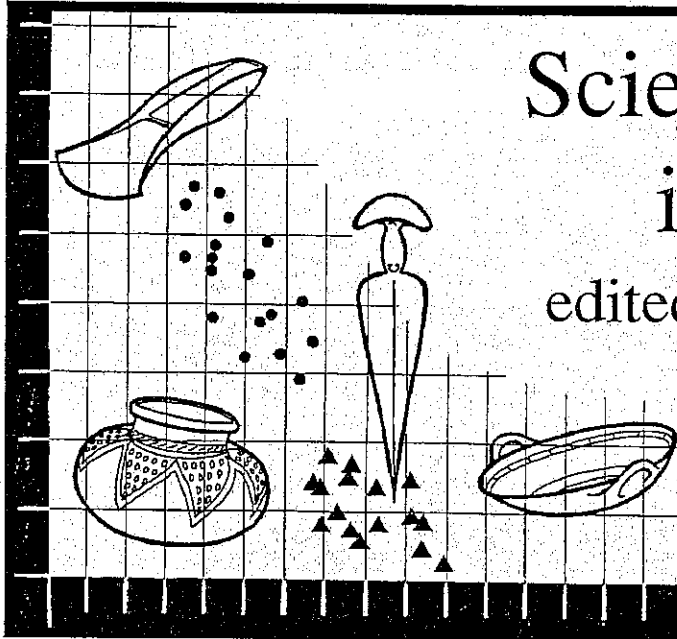
For registration or information, contact:

Dr. Peter M. Fischer, SAC, SIMS Lab, Department of Physics,  
Chalmers University of Technology, S-412 96 Gothenburg,  
Sweden.

Telephone: +46-(0)31-72 34 31 or 49 40 58

FAX: +46-(0)31-72 34 36 or 49 40 58





# Scientific Analysis in Archaeology

edited by Julian Henderson

Archaeological Research Tools 5  
(Co-published with Oxford University,  
Monograph 19).  
1989.  
List Price: \$18.00  
Special Discount Price: \$14.40

This book presents a wide range of practical examples using scientific analysis applied to archaeological materials. Emphasis is placed on the interpretation of the results rather than on the techniques themselves. Topics covered include: soil phosphate analysis (Bethell & Máté); ancient glass (Henderson); ceramic technology and stylistic change (McGovern); red painted surfaces on Mesoamerican ceramics (Beaudry); pottery in Neolithic Ireland (Sheridan); neutron activation analysis and Romano-British pottery studies (Evans); petrography of Saxon and Early Medieval pottery (Vince); early mining and metallurgy (Craddock); non-ferrous metallurgy (Northover); texts and metal artifacts (Scott); iron industry in Iron Age Britain (Salter); and lead isotope studies in Bronze Age Mediterranean (Stos-Gale). ISBN: 0-917956-66-4.

### Also from UCLA Institute of Archaeology

**A Conservation Manual for the Field Archaeologist.** C. Sease. Archaeological Research Tools 4. 1987. 170 pp. ISBN: 0-917956-59-1. List Price: \$16.00 Discount Price: \$12.80.

**Obsidian Dates II: A Compendium of Obsidian Hydration Determinations Made at the UCLA Obsidian Hydration Laboratory.** C. W. Meighan and P. I. Vanderhoeven, eds. Monograph 6. 1978. 187 pp. ISBN: 0-917956-28-1. List Price: \$7.50 Discount Price: \$5.20.

**Obsidian Dates III: A Compendium of Obsidian Hydration Determinations Made at the UCLA Obsidian Hydration Laboratory.** C. W. Meighan and G. S. Russell, eds. Monograph 16. 1981. 169 pp. ISBN: 0-917956-20-6. List Price: \$7.50 Discount Price: \$5.20.

**Obsidian Dates IV: A Compendium of Obsidian Hydration Determinations Made at the UCLA Obsidian Hydration Laboratory.** C. W. Meighan and J. D. Scalise, eds. Monograph 29. 1988. 512 pp. ISBN: 0-917956-61-3. List Price: \$18.75 Discount Price: \$16.88.

**The Osteology of South American Camelids.** V. R. Pacheco T., A. Altamirano E., & E. Guerra P.; trans. by E. Sandefur. Archaeological Research Tools 3. 1987. 32 pp. ISBN: 0-917956-57-5. List Price: \$6.50 Discount Price: \$5.20.

**Pots and Potters: Current Approaches in Ceramic Archaeology.** P. Rice, ed. Monograph 24. 1984. 255 pp. ISBN: 0-917956-44-3. List Price: \$22.50 Discount Price: \$18.00.

**Practical Archaeology: Field and Laboratory Techniques and Archaeological Logistics.** Rev. ed. B. D. Dillon, ed. Archaeological Research Tools 2. 1989. 141 pp. ISBN: 0-917956-64-8. List Price: \$16.00 Discount Price: \$12.80.

Qty	Name	Code	Price	Cost
_____	Practical Archaeology, Dillon	ART02	\$12.80	_____
_____	Scientific Analysis, Henderson	ART05	\$14.40	_____
_____	Obsidian Dates II, Meighan	MO06	\$5.20	_____
_____	Obsidian Dates III, Meighan	MO16	\$5.20	_____
_____	Obsidian Dates IV, Meighan	MO29	\$16.88	_____
_____	Osteology of Camelids, Pacheco	ART03	\$5.20	_____
_____	Pots & Potters, Rice	MO24	\$18.00	_____
_____	Conservation Manual, Sease	ART04	\$12.80	_____

Sales tax: 6.25% CA only; 6.75 % Los Angeles  
Postage & handling \$3.50  
TOTAL \_\_\_\_\_

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Orders must be prepaid in U.S. dollars; checks/money orders payable through a U.S. bank.

I-90-6

# 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.

## October

**Oct. 29-Nov. 1. Geological Society of America Annual Meeting.** Dallas. GSA Meeting Department, PO Box 9140, Boulder, CO 80301 (303) 447-2020. 13(3),11.

**Oct. 29-Nov. 16. Workshop on Mathematical Ecology.** Trieste. International Centre for Theoretical Physics, PO Box 586 Miramare, Strada Costiera 11, I-34100 Trieste, Italy.

**Oct. 31-Nov. 2. Pacific Conference on Chemistry and Spectroscopy.** San Francisco. Richard Gaver, Chemistry Department, San Jose State University, San Jose, CA 95192 (408) 924-4974. 13(3),14.

## November

\* **Nov. 7-10. Southeastern Archaeological Conference, 47th Annual Meeting.** Mobile. Edwin Jackson, Department of Sociology and Anthropology, University of Southern Mississippi, Hattiesburg, MS 39406 (601) 266-4306. Proposal deadline: 8/31/90.

\* **Nov. 9-11. Eastern States Archaeological Federation, 57th Annual Meeting.** Columbus, Ohio. Martha Otto, Ohio Historical Society, 1982 Velma Ave., Columbus, OH 43211-2497. Featured: eastern U.S. burial practices and contact-period archaeology.

\* **Nov. 11-15. American Nuclear Society Winter Meeting.** Washington, DC. Loring Mills, Edison Electric Institute, 1111 19th St. NW, Suite 600, Washington, DC 20036 (202) 778-6750.

\* **Nov. 11-15. 11th Annual Meeting of the Society of Environmental Toxicology and Chemistry.** Arlington, Virginia. R.M. Dickhut, SETAC, 1101 14th St. NW, Washington, DC 20005.

+ **Nov. 11-16. Eastern Analytical Symposium.** Franklin Township, New Jersey. EAS, PO Box 633, Montchanin, DE 19710 (302) 453-0785. Includes courses on: Thermal analysis in materials characterization; New sample preparation methods for chemical analysis; Gas chromatography/Mass spectrometry; Interpretation of IR spectra. Session topics include: NMR, atomic, and molecular spectroscopy; environmental chemistry; materials science.

**Nov. 12-23. 2nd World Climate Conference.** Geneva. World Meteorological Organization, Ave Giuseppe Motta 41, CH-1202 Geneva, Switzerland.

**Nov. 13-15. 2nd International Ceramic Science and Technology Congress.** Orlando, Florida. American Ceramic Society, 757 Brooksedge Plaza Drive, Westerville, OH 43081-6136 (614) 890-4700.

\* **Nov. 18-20. International Symposium on Quaternary Shorelines: Evolution Processes and Future Changes.** International Symposium, c/o Enrique Schnack, Lab. Oceanografia Costera, Facultad de Ciencias Naturales, Casilla de Correo 45, 1900 La Plata, Argentina.

\* **Nov. 19-23. Geological Congress of Central America.** San Jose, Costa Rica. Escuela Centroamericana Geologia, U.C.R., Apartado 35 (2060), University of Costa Rica, San Jose, Costa Rica (00506-25-7941; FAX 00506-25-7941).

**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.

\* **Nov. 28-Dec. 2. American Anthropological Association, 89th Annual Meeting.** New Orleans. AAA, 1703 New Hampshire Ave. NW, Washington, DC 20009. Sessions include: North American archaeology; Medical anthropology; Agave, mescal, maguey - prehistoric cultivation in arid North America; Archaeological research in the Old World.

\* **Nov. 29-Dec. 1. Canadian Association for Physical Anthropology, 18th Annual Meeting.** Banff, Alberta. Anne Katzenberg, Department of Archaeology, University of Calgary, Calgary, Alberta T2N 1N4 Canada (403) 220-5227. Abstract deadline: 10/15/90.

## 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. 9-12. Annual Winter Simulation Conference.** New Orleans. Randall P. Sadowski, Systems Modeling Corporation, 504 Beaver St., Sewickley, PA 15143 (412) 741-3727.

**Dec. 16-19. 11th Annual Conference on Information Systems.** Copenhagen. Lewis E. Leeberg, UCLA, AGSM, 405 Hilgard Avenue, Los Angeles, CA 90024-1481 (213) 825-1428.

**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.

# Meetings Calendar

## January 1991

Jan 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. 13(2).

Jan. 14-18. **5th International Colloquium on Physical Measurements and Signatures in Remote Sensing.** Courchevel. International Society for Photogrammetry and Remote Sensing, Courchevel-Resevation, Colleeque CNES, La Croisette, 73 120 Courchevel, France.

\* Jan. 17-18. **Goldsmith's Tools and Workshops Worldwide from the Vth Millennium B.C. to the XVIIth Century A.D.** St. Germain en Laye, France. Christiane Eluere, Musee des Antiquites Nationales - B.P. 30, F. 78103 St. Germain en Laye, France (1-34-515365; FAX 1-34-517393). Proposal deadline: 8/15/90. Theme: the collating of information on tools, ancient processes and their development, and workshops, from different regions during prehistoric, classical, mediaeval and post-mediaeval periods.

+ Jan. 29-Feb 1. **4th Australian Archaeometry Conference.** Canberra. Archaeometry Conference, Prehistory Department, RSPacS, The Australian National University, GPO Box 4, Canberra ACT 2601, Australia FAX 06-257-1893. 13(3),2,14.

## February

\* Feb. 14-19. **American Association for the Advancement of Science Annual Meeting.** Washington DC. Poster session deadline: 11/2/90. Archaeology symposia include: Scientific uses of light stable isotopes; Biomolecular identification of the species of origin of blood residues on artifacts.

\* Feb. 21-22. **Geophysical Data Inversion in Archeological Site Investigation.** Berlin. Institut fuer Geophysikalische Wissenschaften, Mathematische Geophysik, Freie Universitaet Berlin, Podbielskiallee 60, D-1000 Berlin 33 (49-30-8386368; FAX 49-30-8311239). Abstract deadline: 11/1/90.

## March

\* March 4-8. **42nd Pittsburgh Conference and Exposition on Analytical Chemistry and Applied Spectroscopy.** Chicago. Pittsburgh Conference, 300 Penn Center Boulevard, Suite 332, Pittsburgh, PA 15235. Tentative symposia include: LIMS; NMR; atomic spectroscopy.

March 20-21. **Discussion Meeting on Molecular Palaeontology.** London. The Scientific Meetings Secretary, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG, U.K.

March 24-28. **European Union of Geological Societies, 10th Anniversary Meeting.** Strasbourg, France. Organizing Committee EUG VI, University of Trieste, Institute of Mineralogy, Piazzale Europa 1, I-34100 Trieste, Italy.

## April

\* April 1-5. **24th Annual Simulation Symposium; sponsored by Society for Computer Simulation.** New Orleans. George Zobrist, Department of Computer Science, University of Missouri, Rolla, Missouri 65436 (314) 341-4836; EMAIL c2816@umrvmb.umn.edu.

\* April 8-11. **Annual Chemical Congress of the Royal Society of London.** London. Royal Society of Chemistry, Burlington House, London W1V 0BN, U.K.

\* April 10-12. **Scanning Microscopy Conference.** Atlantic City. Mary K. Sullivan, FAMS Inc., Box 832, Mahwah, NJ 07430 (201) 818-1010.

\* April 13-17. **Association of American Geographers, Annual Meeting.** Miami. Linda Snyder, Conference Assistant, AAG, 1710 16th St. NW, Washington, DC 20009-3198 (202) 234-1450; FAX (202) 234-2744.

April 14-18. **Institute of Mining and Metallurgy, 6th International Symposium and Exhibition.** London. IMM, The Conference Office, 44 Portland Place, London W1N 4BR, U.K.

\* April 22-25. **American Physical Society Spring Meeting.** Washington DC. APS, 335 E. 45th St., New York, NY 10017 (212) 682-7341.

\* April 22-25. **Geographical Information Systems - Multiple Representation and Multiple Uses; sponsored by the International Geographical Union.** Dr. Milan Konecny, Department of Geography, Masaryk University, Kotlarska 2, 611 37 Brno, Czechoslovakia (05-740-500; FAX 42-5-24680). Abstract deadline: 8/15/90.

\* April 23-28. **Society for American Archaeology, 56th Annual Meeting.** New Orleans. Timothy Kohler, Department of Anthropology, Washington State University, Pullman, WA 99164. Submission deadline: 10/1/90.

\* April 29-May 3. **Material Research Society Spring Meeting.** Anaheim. Merry Geil, MRS, 9800 McKnight Rd., Pittsburgh, PA 15237 (412) 367-3003.

## May

\* May 2-3. **22nd Annual Pittsburgh Conference on Modeling and Simulation.** W.G. Vogt, Modeling and Simulation Conference, 348 Benedum Engineering Hall, University of Pittsburgh, Pittsburgh, PA 15261. Abstract deadline: 1/31/91. Topics include social, economic, geography, regional science, and global modeling and simulation.

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.

# Meetings Calendar

## August

\* May 20-24. **Short Course on X-Ray Powder Diffractometry and Spectrometry.** Austin. College of Engineering, University of Texas, Austin, TX 78712 (512) 471-3506.

\* May 23-25. **Modern Tools in Archaeometry;** sponsored by the Scandinavian Archaeometry Center. Gothenburg, Sweden. Dr. Peter M. Fischer, SAC Chairman, Department of Physics, Chalmers University of Technology, S-142 96 Gothenburg, Sweden 46-031-723431; FAX 46-031-723436; EMAIL(EARN) F8BUE@SECTHF51.

May 27-29. **Geological Association of Canada Annual Meeting.** Toronto. J. Fawcett, Department of Geology, University of Toronto, Toronto, Ontario, Canada M5S 1A6.  
Baltimore. AGU Meetings, 2000 Florida Avenue NW, Washington, DC, 20009 (202) 462-6900.

May 29-June 2. **European Association of Exploration Geophysicists, 53rd Annual Meeting.** Florence, Italy. Evert van der Gaag, EAEG, Wassenaarseweg 22, NL-2596 CH The Hague, The Netherlands.

May 30-31. **Discussion Meeting on the Foraging Strategies and the Natural Diet in Monkeys, Apes and Humans.** London. Scientific Meetings Secretary, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG, U.K.

## June

June 2-6. **Annual Meeting of the American Nuclear Society.** Orlando, Florida. ANS, Meetings Department, 555 N. Kensington Avenue, La Grange Park, IL 60525 (312) 352-6611.

\* June 4-6. **5th International LIMS Conference.** Egham, Surrey, U.K. Registrar, 5th LIMS Conference, PO Box 341, High Wycombe, Buckinghamshire HP11 2QG, U.K.

June 9-14. **27th Colloquium Spectroscopicum Internationale.** Bergen. Secretariat of XXVII, HSD Congress-Conference, PO Box 1721 Nordnes, N-5024 Bergen, Norway 47-5-318414; FAX 47-5-324555.

June 15-19. **American Society of Mammologists, Annual Meeting.** Manhattan, Kansas. M.E. Hight, Department of Biological Sciences, Marshall University, Huntington, WV 25755.

## July

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.

\* July 29-Aug. 2. **18th Annual Conference and Exhibition on Computer Graphics and Interactive Techniques.** Las Vegas. Smith Bucklin and Associates, 111 East Wacker Dr., Chicago, IL 60601 (312) 644-6610.

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.

August 11-24. **International Union of Geodesy and Geophysics, 26th General Assembly.** Vienna. F. Wiederstein, BM fr Land- und Forstwirtschaft, Hydrographisches Zentral-buro, Marxergasse 2, A-1030 Vienna, Austria.

\* Aug. 13-16. **Sedimentary and Paleolimnological Records of Saline Lakes.** Saskatoon. Robin W. Renaut, Department of Geological Sciences, University of Saskatchewan, Saskatoon, S7N 0W0 (306) 966-5683; FAX (306) 966-8593.

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.

## Fall 1991

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.

\* Sept. 10-13. **Conference on Advances in Instrumentation and Techniques for Electron and Other Microscopies.** Bristol, U.K. Meetings Office, Institute of Physics, 47 Belgrave Square, London SW1X 8QX, U.K.

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. Abstract deadline: Spring, 1991.

\* Oct. 21-24. **Geological Society of America Annual Meeting.** San Diego. GSA, 3300 Penrose Place, Boulder, CO 80301 (303) 447-2020.

\* Oct. 27-Nov. 1. **Soil Science Society of America Annual Meeting.** Denver. SSA, 677 S. Segoe Road, Madison, WI 53711 (608) 273-8080.

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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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