SAS Bulletin
Society for Archaeological Sciences

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Society for Historical Archaeology

The Society for Historical Archaeology was formed in 1967 to promote anthropological and historical studies by advocating scientific research, interdisciplinary cooperation, professional standards, conservation of historical resources, and dissemination of knowledge. Membership is open to all persons involved in the study of historic sites, as well as those interested in following current trends in historical archaeology and the archaeological sciences.

The Society holds an annual Conference on Historical and Underwater Archaeology in early January. The 1994 Conference will include a plenary session on "Current and Future Applications of Science and Technology in Historical and Underwater Archaeology" which is being organized by SAS President Erv Garrison (University of Georgia). This session should be of particular interest to SAS members, although the program every year includes papers on a full range of traditional archaeological science topics. For further information about the 1994 Conference contact: SHA 94, Department of Archaeology, Simon Fraser University, Burnaby, British Columbia, Canada V5A 1S6.

The Society for Historical Archaeology also publishes a refereed quarterly journal, *Historical Archaeology*, and a *Newsletter*. Both of these frequently feature the archaeological sciences. Recent issues of the journal have included articles on paleoethnobotany, zooarchaeology, nautical archaeology, industrial archaeology, landscape archaeology, metallurgy, and the use of such tools as ground-penetrating radar and magnetometers. Articles are invited and should be sent to Ronald L. Michael, Anthropology Section, California University of Pennsylvania, PA 15419. *Underwater Archaeology Proceedings from the Society for Historical Archaeology Conference* are published on an annual basis and *Guides to the Archaeological Literature of the Immigrant Experience In America* are published occasionally.

There are six levels of membership: Individual ($50 per year), Adjunct ($10), Student ($30), Sustaining ($100), Patron ($150), Life ($1,000), and Institutional ($65), payable in U.S. funds only please. For further information about membership or the society contact: The Society for Historical Archaeology, PO Box 30446, Tucson, AZ 85751-0446. □

New SAS Membership Rates

You will soon be receiving SAS renewal notices for 1994. The new dues structure is given below. Increases are due to higher rates for an expanded *Journal of Archaeological Science* (*JAS*) and an overdue increase in some of our dues categories. Credit card payment includes a 7% surcharge.

Membership Category	Check	Credit Card
REGULAR (*SAS Bulletin* and *JAS*)	$75.00	$80.25
STUDENT/RETIRED/EMERITUS (*SAS Bulletin* only)	$15.00	$16.05
INSTITUTIONAL (*SAS Bulletin* only)	$30.00	$32.10
LIFETIME (existing) (*SAS Bulletin* in perpetuity, and *JAS* for 1 year)	$60.00	$64.20
LIFETIME (new) (*SAS Bulletin* in perpetuity)	$300.00	$321.00
LIFETIME (new) (*SAS Bulletin* in perpetuity, and *JAS* for 1 year)	$360.00	$385.20
Associate	Contact Secretary/Treasurer	

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In This Issue

Laboratory Profile

University of Sheffield, Department of Archaeology and Prehistory
Research School of Archaeology and Archaeological Science

ACADEMIC STAFF & THEIR RESEARCH INTERESTS

Keith Branigan Ph.D. (Birmingham) Professor and head of Department - metallurgy, Aegean Bronze Age, mining

Paul Buckland Ph.D. (Birmingham) Lecturer - Quaternary entomology, tephra, the settlement and ecological history of north Atlantic islands

Andrew Chamberlain (Liverpool) Lecturer - systematics of early hominids, forensic anthropology and palaeopathology

John Collis Ph.D. (Cambridge) Professor - coinage, Iron Age, IT applications, publications

Peter Day Ph.D. (Southampton) Lecturer - ceramic petrology, experimental and ethnographic approaches

Robin Dennell Ph.D. (Cambridge) Senior Lecturer - early prehistory of southern Asia and eastern Europe, origins of farming

Randolph Donahue Ph.D. (Michigan State) Lecturer - light technology, microwear, Mesolithic, Palaeolithic of Italy

Mark Edmonds Ph.D. (Reading) Lecturer - GIS, lithics, and landscape archaeology

Andrew Fleming M.A. (Cambridge) Reader - landscape archaeology, upland environments, Neolithic and Bronze Age

David Gilbertson D.Sc. (Bristol) Professor and Head of the Research School - geoarchaeology, cave geology, ancient floodwater farming in North Africa

Paul Halstead Ph.D. (Cambridge) Senior Lecturer - archaeozoology and palaeoeconomy, ecology of early farming

Julian Henderson Ph.D. (Bradford) Lecturer - characterization of archaeological materials, especially ancient glasses

Richard Hodges Ph.D. (Southampton) Professor and currently Director of the British School at Rome - ceramic petrology, the early medieval period

Glynis Jones Ph.D. (Cambridge) Senior Lecturer - archaeobotany and ethnobotany, advanced statistical applications

John Moreland Ph.D. (Sheffield) Lecturer - ceramic studies and medieval Europe

Barbara Ottaway Ph.D. (Edinburgh) Senior Lecturer - early copper mining and metallurgy, statistical approaches

Michael Parker Pearson Ph.D. (Cambridge) Lecturer - ethnography, funerary archaeology, rescue management

Marek Zvelebil Ph.D. (Cambridge) Senior Lecturer - Mesolithic, transition to agriculture, human skeletal studies

Honorary Lecturers

Bob Bewlay Ph.D. (Cambridge) - air photography

Patricia Phillips Ph.D. (Nottingham) - lithic technology and ancient blood proteins

Derek Riley Ph.D. Hon. (Sheffield) - air photography

English Heritage Research Dendrochronologists

Jennifer Hillam B.Sc. (Sussex)

Cathy Groves B.Sc. (Nottingham Trent)

Research Fellows

Rosalind Coard Ph.D. (Sheffield) - taphonomy of Pleistocene vertebrates

Jon Sadler Ph.D. (Sheffield) - palaeoentomology, biogeography, tephra studies

Paul Nicholson Ph.D. (Sheffield) - ancient ceramics, experimental and ethnographic studies

Teaching Fellows

Michael Charles Ph.D. (London) - archaeobotany

Caroline Jackson Ph.D. (Bradford) - archaeometallurgy

Colin Merrony M.A. (Bradford) - geophysical and topographical surveys

Elizabeth Rega M.A. (Chicago) - human skeletal remains

Patricia Wagner B.Sc. (Open) Co-ordinator of the Sheffield Environmental Facility - molluscan and beetle studies

Archaeological Research Consultancy of the University of Sheffield (ARCUS)

Jim Symonds B. Sc. (Sheffield), Director - survey

Barbara Brayshay Ph.D. (Sheffield) - palynology

Mark Dinnin Ph.D. (Sheffield) - Quaternary entomology and conservation

Principal Collaborators within the University of Sheffield

Dr. R. Craig, School of Dentistry

Drs. N.R.J. Flaller and E.C. Flenley, School of Mathematics

Dr. R Sokal, Northern General Hospital, Sheffield

Dr. D. Whiteman, School of Materials Science

This department achieved the top Grade 5A rating in the United Kingdom government's recent review of the importance of research in British Universities. The Department's research interests range in time from the Plio/Pleistocene to the early modern period, and then on to problems of contemporary nature conservation and future management. They range in space from Greenland to the Czech Republic, Russia, Pakistan and Australia, and from north Africa, southwest Asia to the Malagasy Republic. Obviously Western Europe and the British Isles are the subject of much research attention, with the Aegean and Italy being researched by a number of the academic staff. All of the Department's staff are active in research and a typical annual output of research publications includes four of five books and about fifty papers. David Gilbertson and Julian Henderson are the United Kingdom editors of the *Journal of Archaeological Science*. The present Research School is composed of over 100 people, of whom nearly 80 are full-time or part-time postgraduate students. About 30% of the postgraduate research students come from outside the U.K., notably Canada and Greece. The department has a long tradition of research in Theoretical Archaeology and Social Archaeology, Human Skeletal Studies, and Environmental Archaeology, to which a further specialization in Materials Science has been added in recent years. At present, the research activities of the Department are organised into four research groupings, each of which is discussed below.

BIOARCHAEOLOGY AND GEOARCHAEOLOGY RESEARCH GROUP

This is a large and buoyant area of research activity whose diversity is difficult to summarise. The research includes archaeozoology, archaeobotany, dendrochronology, geoarchaeology, palaeoecology, palaeoentomology and tephra studies. Identifying the nature and significance of past human activities and past environments is a major theme in much research. Fortunately, or unfortunately, the clarity of these archaeological goals is often deceptive, and more complex research strategies involving studies of place, environment, event, process, time, as well as people are necessary to address them. Staff research ranges from investigations of naturally-occurring processes and environmental changes, for example at the late Devensian/early Holocene, along shorelines especially in major coastal dune systems, in caves, in the Libyan desert of north Africa, the pedological and biological changes caused by the impact of acid Icelandic tephra on north British ecosystems, to more familiar investigations of ancient economies, subsistence, and environmental reconstruction. Other research programmes are concerned with the taphonomy of vertebrates in Plio-Pleistocene rivers in Pakistan; the taphonomic processes affecting the abundance and distribution of seeds, vertebrates, pollen, molluscs and beetles in both "natural" environments - caves, windswept locations, and bogs - as well as archaeological situations - for example in managed woodlands, industrial sites, inhabited caves, and on "traditional" farms. The objectives of these investigations of situation and process include not only the better interpretation of the archaeological and paleoecological records, but also aim to provide better information on nature, site and landscape management. Studies designed to improve the theoretical and analytical bases of a number of procedures are also being carried out - for example, the mathematical modelling of particle size distributions, and of quantitative studies of phytoliths in the coastal ecosystems in northern Britain. There are numerous projects of a more geographically or time-specific nature underway. The investigations of ancient agriculture and traditional Mediterranean farming by Drs. Halstead and Jones are well-known. The explorations of ancient flood-water farming and environmental change in the Libyan Desert by Professor Gilbertson as part of the UNESCO Libyan Valleys Survey are now drawing to an end. In recent years the most wide-ranging and best-funded project has been the investigation of the biogeography - especially human and Coleopteran - of north Atlantic islands by Paul Buckland. This project has paid particular attention to human agencies in the spread of animals and the modification of environments, and the detection of the influence of airfall acid tephra on people, their agriculture and environment. Robin Dennell is the Director of the British Archaeological Mission to Pakistan which, over a number of very successful years, has seen quite remarkable discoveries and investigations of vertebrates and palaeoliths from the Pliocene-Pleistocene deposits of the Siwalik Hills in Pakistan. Much of the environmental work of the Department has been integrated into wider studies of landscape archaeology. The SEARCH programme - Sheffield Environment and Archaeology Research Campaign in the Hebrides - is one such project which is now in its sixth year. This project is designed to record and interpret all aspects of the archaeology and the past and present landscapes of these Atlantic islands which form the northwest coast of Scotland. The project also serves as a training ground for undergraduate archaeologists and is the location for field research training for some of the Masters and Doctoral students in the Department. Major research grants or contracts are also held for Dendrochronology and the Sheffield Environmental Facility. The Dendrochronology Laboratory is funded by the United Kingdom's government agency English Heritage and is responsible for most of the tree-ring dating of archaeological materials - from excavations as well as standing buildings - carried out in Great Britain. Their work does not limit itself to the production of felling dates. Archaeological interpretation is paramount. In recent years investigations of the theory of cross-dating, ancient woodland structures and management, timber procurement and management have become important. The Sheffield Environment Facility is funded by a group of U.K. government research agencies via the Science and

Engineering Research Council (SERC) to provide palaeoenvironmental services to other universities, or other archaeological agencies.

HUMAN SKELETAL STUDIES RESEARCH GROUP

Research on human remains in this Department was started by the late Mr. Justin Chesterman, a distinguished and innovative Sheffield surgeon, who provided in his "retirement" tuition and guidance for both undergraduate and postgraduate students in Sheffield, as well as specialist reports for British archaeologists. The facilities, reference collections, and range of research activities considerably expanded with the appointment of Andrew Chamberlain, and later, Beth Rega to the Department. There are now substantial research programs investigating primate and human evolution, palaeopathology, and of special interest, investigations of Stone Age human skeletal remains from Russia, Ukraine, and Estonia. Over the past six years a major collaboration has taken place between Pat Phillips and Andrew Chamberlain and immunologists and serologists in the School of Medicine who are based in University Teaching Hospitals and the Blood Transfusion Service. The resulting successful detection and analysis of residues of ancient blood proteins on artifacts has been published in a well-known series of papers in *Nature* and elsewhere. This work is now expanding and continues to the benefit from the expertise that senior, medically-qualified staff can bring to archaeological science. More traditional work on ancient human remains - bones and teeth - continues apace, with notable numbers of skeletons arriving for study from rescue excavations, with funding being provided ARCUS, SEF and private sponsors. The use of EDMA to identify the mineralogy of copper-based ores in a clay paste on the skin of Lindow Man by Paul Buckland attracted much popular interest when he and his collaborators demonstrated that this particular ancient Britain was not decorated in a blue dye from woad, rather he was green.

MATERIALS SCIENCE RESEARCH GROUP

The applications of materials science to artifacts in the Department began with the interest of Pat Phillips, Robin Torrance and, most recently during the stay of Randy Donahue with his expertise in microwear. Richard Hodges initiated research in ceramic petrology and Keith Branigan in metallurgy. The character of our Materials Science research group changed four years ago with the transfer to Sheffield of Barbara Ottaway specialising in archaeo-metallurgy from Bradford, and Paul Buckland with his knowledge of building stones from Birmingham. Physico-chemical analyses, experimental studies of ancient technologies, and mining procedures have been developed, often using the excellent facilities of the University's Departments of Ceramics, Polymers, Glasses and Metallurgy. The scope and scale of this work further increased with the appointments of Julian Henderson, who specializes in the study of high-temperature industries, especially ancient vitreous materials, and Peter Day, with his experimental, petrological and ethnographic studies of ceramic manufacture in the Aegean. Throughout this period Paul Nicholson has been active exploring in the field and simulating in the laboratory the technologies of ceramic manufacture in Egypt.

THEORETICAL AND SOCIAL ARCHAEOLOGY

This is a major area of Departmental research, which may or may not contain scientific components, depending upon the person and the situation.

FACILITIES

The Department occupies four buildings which include extensive laboratories, two minibuses, four EDMs, and it also shares in the ownership of a light aircraft. The laboratory facilities occupy about 500 m^2. The environmental archaeology laboratories are equipped to investigate biological, geomorphological, and sedimentological evidence. Specialist reference collections are maintained for the study of seeds, pollen, and beetles. The Skeletal Teaching Laboratory provides facilities for the identification, quantification, and analysis of animal bone assemblages, including a large comparative collection of bones of domesticated and wild mammals and birds. The Skeletal Research Laboratory contains measurement and analytical equipment, X-ray facilities, and a bench collection of reprints, slides, and photographs. A large reference collection of human skeletal remains from Anglo-Saxon and Medieval Sites is held in the laboratory. The Material Culture Laboratory is designed for the microscopic and macroscopic analysis of lithic, ceramic, and vitreous materials. A "Scopeman" Nikon with co-observation facility and Leitz Metallux 2 microscope with closed circuit television and camera both exist for a variety of research purposes. The Preparation and Extraction Laboratory deals with the extraction of seeds, bones, molluscs, and insects, noisy and messy studies of sediments, and in a protected area, the preparation of "thin-sections" of bone, shell, ceramics, and flint. The Dendrochronology Laboratory is equipped with computer-linked growth increment measuring stages, and tree-ring chronologies from across the British Isles and western Europe. The Practicals and Teaching Laboratory is also available for part of the year for sorting, classifying, and examining microscopic materials obtained from staff and student project. There are substantial transmitted- and reflected-light microscope facilities within the Department. SEMs (scanning electron microscopes) are located within the Sorby Microscope Centre of the University. The Library and Drawing Office block contains the Batsford Library, which in addition to books, also houses the Higgs and Waachter Reprint Collections (about

7,000 reprints). In addition to the networked laboratory PC's or Macintoshs, there are two Computing Laboratories which contain a network of IBM-PC compatible microcomputers, which are also linked to University, national, and international networks. The department is fairly close to the staff, specialist facilities, and libraries in University of Sheffield's Schools of Medicine, Dentistry, Mathematics, Earth Sciences, Materials Sciences and Geography who are our principal long-term research collaborators.

TRAINING AND FUNDING

The Department offers a B.Sc. (Honours) degree in Archaeological Sciences, in addition to its B.A. (Honours) degrees Archaeology and Prehistory, and various dual honours degrees available with Medieval History, Geography, Earth Sciences, and Landscape Design. Postgraduate research training in Archaeological Sciences is a major activity of the Department. This has two components: one-year taught Master's degrees, and research degree programs for the M. Phil. (one year) and Ph.D. (three years). The M.Sc. in Environmental Archaeology and Palaeoeconomy has been running since 1981. This is recognized as both an intensive training course for postgraduates seeking an advanced career-oriented education, and as vital training for people who wish to continue to Ph.D. research. The course is recognized by the Science and Engineering Research Council and holds from SERC a QUOTA allocation of four studentships - fees plus substance which are available to UK and EC citizens. It takes between 16 and 20 Masters students each year. The M.Sc. in Osteology, Paleaopathology, and Funerary Archaeology is taught jointly with the School of Archaeological Sciences at the University of Bradford. It also provides both an advanced vocational training as well a vital introduction to Ph.D. research. It holds a SERC QUOTA allocation of two studentships - fees and subsistence - each year and takes about 18 - 20 students per year. Archaeological Science may form part of the M.A. in Archaeology and Prehistory which has a modular form and serves as either a conversion course for people whose first subject is not Archaeology, or as a means of allowing specialisation in particular subject areas selected by the postgraduate. This course takes 8-10 students per year. The success of these three Masters programs has encouraged the Department to plan to introduce three new Masters programs in October 1994 - Materials Science in Archaeology, Palaeoanthropology, and Landscape Archaeology. In recent years the University of Sheffield and the Department have created a significant number of Ph.D. scholarships (fees and subsistence), as well as individual bursaries, for which postgraduates of any nationality are eligible to compete. These add to the QUOTA allocation of studentships for UK/EC applicants awarded to the Department by the SERC, as well as more familiar funding routes via the British Academy, Commonwealth Scholarships, Fulbright Scholarships, ORS and ODASS sources. The annual research grant income to the staff of the Department is in the order of £260,000 per year.

At the moment of writing this summary, re-painting and re-carpeting are underway in the building that will be the organisational focus of the Research School. For the first time, it will be possible to provide office accommodation for visiting scholars. Such visitors we hope will continue to find an active, friendly, enthusiastic, and outward-looking Department, busy with its teaching and research, which also has the good fortune to be located in one of the cheapest and the most attractive parts of England. Please visit us.

Contributed by David Gilbertson, University of Sheffield, Department of Archaeology and Prehistory, Sheffield S10 2TN, UK □

Conferences in Greece

Several meetings concerning the archaeological sciences have been organized in Greece for the 1993-1994 period.

The International Seminar on "Historical and Monumental Structures in Seismic Regions" was organized by the European Centre on Prevention and Forecasting of Earthquakes and took place on the island of Santorini, Greece, 14-16 October, 1993. A large number of papers was presented concerning: the recognition of seismic phenomena in historical and ancient times; the seismic awareness in historical and ancient times, as seen through structural and constructional evidence; the estimation of seismic response of historical and monumental structures; and the methods of reinforcement, repairing and restoration of historical and monumental structures. The seminar was concluded with a table ronde concerning the international efforts for the rescue and restoration of historical and monumental structures. Just a day prior to the seminar there was a workshop on the "Construction Techniques in Seismic Regions in Prehistoric Times." Finally, the seminar included a visit to the archaeological site of Akrotiri under the guidance of the excavator of the site, Prof. Ch. Doumas.

The European Symposium "Information Technology and Museums" was organized by the Goethe Institut and the Lambrakis Research Foundation in Athens, 19-20 November, 1993. The presentations at the symposium referred to the different computer systems developed for handling, recording, restoring and preserving the huge amount of data available in museums and at archaeological

Greece (continued on p. 19)

SAS Newsletter Index
Volumes 1-3

This index of our early volumes complements the index for volumes 4-15 published in the SAS Bulletin, 16(2):8-12. The cumulative index for volumes 1-15 is available from the compiler or from the editor as a text file or as a Macintosh FoxBase file.

Compiled by Jody Dalton, Department of Geosciences, Franklin and Marshall College, Lancaster, PA 17604-3003; e-mail JJ_Dalton@Acad.FandM.edu □

News of Archaeometallurgy

The Society of Jewelry Historians and the Department of Greek and Roman Antiquities of the British Museum are sponsoring an international conference on *The Art of the Greek Goldsmith* at the British Museum on October 4-6, 1994. This will be in conjunction with the exhibition "Greek Gold" that opens this summer at the British Museum and travels to the Metropolitan Museum of Art in New York in the Autumn and to the Hermitage in the Spring of 1995. Papers on materials and technology, as well as the art historical development, of Greek gold jewelry and related precious metal objects of the first millennium BC may be submitted; send a detailed abstract of at least 300 words to Dr. Jack Ogden, Cambridge Centre for Precious Metal Research, PO Box 391, Cambridge CB5 8XE, England; fax 44-(0)223-565182. The conference fee will be £45 and will include a special viewing of the exhibition. Members of the Society of Jewelry Historians are already on the mailing list; write Dr. Ogden if you would like to receive information on this conference.

The proceedings of an earlier conference at the British Museum, on the colouring and patination of metals, held in 1990 by the Department of Scientific Research has just been issued. Susan La Niece and Paul Craddock are the editors of *Metal Plating and Patination: Cultural, technical & historical developments*, published by Butterworth Heinemann. The book covers many materials, techniques, and cultural areas in 24 papers, 320 pages and more than 200 illustrations, some in color. It is available (ISBN 0750616113) for £49.50 from Reed Book Services Ltd., PO Box 8, Rushden, Northants NN10 9XF England; telephone 44-(0)933-58521, fax 44-(0)933-410480.

James Thorburn has announced a study tour to Río Tinto and the Iberian pyrite belt in Spain and Portugal provisionally scheduled for April, either the first or second week after Easter. For further information write Atalaya Tours, Ceinionfa, Penglais Terrace, Arberystwyth, SY23 2ET, Wales; telephone 44-(0)970-625077, fax 44-(0)970-617290.

S. Terry Childs and David Killick have published a very useful discussion of sub-Saharan metallurgy, "Indigenous African Metallurgy: Nature and Culture," in the *Annual Review of Anthropology*, 22 (1993) 317-337. David Killick is now preparing a review article for the *Journal of Archaeological Method and Theory* on archaeometallurgy, and would appreciate having your work brought to his attention, especially papers that have been published in journals not immediately available to him. Write Dr. Killick at the University of Arizona Department of Anthropology, Tucson AZ 85721, USA; telephone 602-621-8685, fax 602-621-2088; e-mail Killick@CCIT.Arizona.edu.

If you have any archaeometallurgical news to contribute, please write or call

Martha Goodway, Smithsonian Institution, MRC 534, Washington DC 20560, USA; tel 301-238-3733; fax 301-238-3709. □

Announcements

Wiener Laboratory Fellowships

Larry Angel Fellowship In Human Skeletal Studies

Applications are invited for a one-year Fellowship at the Wiener Laboratory of the American School of Classical Studies at Athens to study human skeletal remains from archaeological contexts in Greece. The Fellowship is open to those working on a doctoral dissertation, as well as to senior scholars, with a stipend of approximately $12,000 to $25,000 depending on seniority and experience in their field, and may be extended or renewed upon appropriate applications.

Applicants should have in mind a specific piece of research which could be undertaken within the given time in the laboratory, or in collaboration with local research institutions with enhanced analytical capabilities. In addition to the research, the Fellow will be expected to contribute to the development of the Lab, to assist with queries from excavators, to offer a lecture on the work undertaken while at the Lab, and to contribute to seminars on aspects of archaeological science as part of the School's annual curriculum.

The appointment will be for one academic year, beginning September 15, 1994. Letters of application, along with a curriculum vitae, a project description of not more than two pages, a list of relevant courses taken or taught, and two letters of reference should be sent to Dr. Sarah J. Vaughan, Director, The Wiener Laboratory, The American School of Classical Studies, 54 Souidias, Athens GR106-76, Greece (tel 30-1-723-6313 ext. 35, or fax 30-1-725-0584). The deadline for applications is March 1, 1994.

Research Fellowship In Faunal Studies

Applications are invited for a one-year Fellowship at the Wiener Laboratory of the American School of Classical Studies at Athens to study faunal remains from archaeological contexts in Greece. The Fellowship is open to those working on a doctoral dissertation, as well as to

senior scholars, with a stipend of approximately $12,000 to $25,000 depending on seniority and experience in their field, and may be extended or renewed upon appropriate applications.

Applicants should have in mind a specific piece of research which could be undertaken within the given time in the laboratory, or in collaboration with local research institutions with enhanced analytical capabilities. In addition to the research, the Fellow will be expected to place a high priority on developing the Lab's comparative collection, contribute to the daily running of the Lab, to assist with queries from excavators, to offer a lecture on the work undertaken while at the Lab, and to contribute to seminars on aspects of archaeological science as part of the School's annual curriculum.

The appointment will be for one academic year, beginning September 15, 1994. Letters of application, along with a curriculum vitae, a project description of not more than two pages, a list of relevant courses taken or taught, and two letters of reference should be sent to Dr. Sarah J. Vaughan, Director, the Wiener Laboratory, The American School of Classical Studies, 54 Souidias, Athens GR106-76, Greece (tel 30-1-723-6313 ext. 35, or fax 30-1-725-0584). The deadline for applications is March 1, 1994. □

SERC/NERC Ancient Biomolecules Initiative

The British Science and Engineering Research Council (SERC) and the Natural Environment Research Council (NERC) are contributing equally to a five-year joint research program started in 1993, with £1.6 million available.

The Ancient Biomolecules Initiative (ABI) builds on research which has been fostered by the Science-based Archaeology Committee (SBAC) and by NERC's Special Topic in Biomolecular Palaeontology. Important recent advances have included analyses of DNA and protein from archaeological bone, DNA and lipids from bogs and plant remains, characterization of food residues from ancient pots, and the isolation of viable bacteria from four-million-year-old ocean sediments. However, much remains to be done and the potential of whole groups of organic compounds such as polysaccharides, lipids and proteins remains largely unexplored.

ABI will seek to foster collaboration between earth scientists, archaeologists, chemists, biochemists and molecular biologists. Three areas identified for special emphasis are biomolecular evolution, molecular biostratigraphy and the biomolecular study of human evolution.

The initiative will be overseen by a joint SERC/NERC panel and will provide a major supplement to both councils' existing support in the area.

Further information can be obtained from: Neil Williams, SBAC Secretariat, SERC, Polaris House, North Star Avenue, Swindon SN2 1ET, tel. 44-(0)793-411-261; or from the SBA Coordinator Sebastian Payne, Ancient Monuments Laboratory, English Heritage, 23 Savile Row, London W1X 1AB, tel 44-(0)71-973-3378, fax 44-(0)71-973-3001. It is expected that an ABI Coordinator will be appointed in due course.

From the Science-Based Archaeology Newsletter, Number 6, January 1993 □

PSILink, CompuServe Bring Internet to All

Internet has created an electronic mail (e-mail) information revolution in academe, but has remained out of reach of the many scientists and students working in the private sector, or even some who work at universities that don't support it. Internet is a vast international computer network that links government, business, research, and academic institutions. Both PSI and CompuServe provide access to Internet for a basic monthly fee. PSILink Basic provides software and local access numbers in 157 cities in North America. The software lets you send unlimited electronic mail to and from other networks and various on-line services including AppleLink, Bitnet, Bix, Genie, and MCI Mail as well as Internet. The software comes with a file transfer program (FTP) to enable downloading of software and reference materials from hundreds of computers worldwide. PSILink is available for a flat fee of $29 per month (1200 bps to 2400 bps) or $39 per month (9600 bps). This gives you unlimited e-mail service. There is also a one-time registration fee of $19. PSI is in Reston, Virginia at 800-827-7482 or 703-620-6651.

CompuServe offers a much greater range of services including electronic bulletin boards (BBS) on almost every topic, airline ticketing services, as well as an e-mail system that allows you to link to Internet. CompuServe also provides local access in many areas of the world. There are a variety of plans at varying costs. The "standard" plan costs about $10 per month. This plan includes a number of free services including access to US National Weather Bureau forecasts, many BBS's, and 60 free e-mail messages per month including Internet. Of course, incoming messages are free. You can send more than 60 messages per month at a nominal charge. CompuServe is in Columbus, Ohio at 800-848-8900 or 614-457-8650.

Those of us who are "hooked" on Internet or Bitnet are able to send messages worldwide in an instant without directly disturbing the addressee. You might be surprised how much faster you can get a response rather than leaving a phone message.

Contributed by M. Steven Shackley, Phoebe Hearst Museum of Anthropology, University of California at Berkeley, 103 Kroeber Hall, Berkeley, CA 94720, USA; tel 510-642-3681; fax 510-643-8557; shackley@cmsa.berkeley.edu □

RADIOCARBON

An International Journal of Cosmogenic Isotope Research

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1994 PRICE LIST

New CALIBRATION 1993 (Vol. 35, No. 1, 1993)	$ 50.00
Proceedings of the 14th International Radiocarbon Conference (Vol. 34, No. 3, 1992)	$ 65.00
Proceedings of the International Workshop on Intercomparison of ^{14}C Laboratories (Vol. 32, No. 3, 1990)	$ 40.00
Proceedings of the 13th International Radiocarbon Conference (Vol. 31, No. 3, 1989)	$ 60.00
Proceedings of the 12th International Radiocarbon Conference (Vol. 28, Nos. 2A & 2B, 1986 - available separately at $30.00 each)	$ 60.00
Proceedings of the 11th International Radiocarbon Conference (Vol. 25, No. 2, 1983)	$ 50.00
Proceedings of the 10th International Radiocarbon Conference (Vol. 22, Nos. 2 & 3, 1980)	$ 60.00
Vol. 36, Nos. 1-3, 1994	**$105.00/vol. Inst.* $ 73.50/vol. Ind. $ 36.75/vol. Stud.****
Vol. 35, Nos. 1-3, 1993 (includes CALIBRATION 1993)	$105.00/vol. Inst. $ 73.50/vol. Ind.
Vol. 34, Nos. 1-3, 1992 (includes Proceedings)	$105.00/vol. Inst. $ 73.50/vol. Ind.
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Book Reviews

Radiocarbon After Four Decades: An Interdisciplinary Perspective. R.E. Taylor, A. Long, & R.S. Kra (eds.). Springer-Verlag and Radiocarbon, New York, 1992, xviii + 596 pp., tables, figures, references, index. $89.00 (hardbound).

Reviewed by Todd A. Koetje, Department of Anthropology, Indiana University of Pennsylvania

The use of radioactive carbon, and its relationships with carbon's other isotopes, for dating and a wide variety of other purposes has led to a revolution in our ability to accurately reconstruct changes in the past. This is very clear in archaeology, but, as may be less well known, radiocarbon dating and related techniques have also had profound impacts in such specific fields as hydrology, climatology, chemistry, astrophysics, and in the earth sciences in general. There are now several distinct techniques used in obtaining radiocarbon dates and other information from the carbon isotopes, and many are relatively quick and inexpensive, particularly when precision is not critical. In addition, research focused on creating calibration curves has focused on tree ring and, more recently coral sequences, making calibration at least theoretically possible back to ca. 28,000 years ago (Stuiver et al. 1991), and holding the promise (?) of someday covering the entire usable radiocarbon range.

"... this volume provides an excellent mix of history, current levels of understanding, and promising future approaches. I found its scope and depth to provide a very satisfying retrospective on the techniques and their applications."

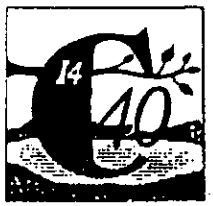
Radiocarbon After Four Decades is truly a festschrift volume developed from the June 4-8, 1990 Lake Arrowhead Conference honoring the four decades of work since Willard F. Libby developed radiocarbon dating techniques at the University of Chicago. The book is divided into nine sections covering both general (Environmental Sciences) and specific (Old World Archaeology) areas of application, techniques (Instrumentation and Sample Preparation), and history (Historical Perspectives). Coverage is somewhat uneven; nine articles deal with facets of the natural carbon cycle, and seven articles are concerned with archaeological applications. In comparison, only two papers are on biomedical applications. This seems reasonably reflective of the popularity and importance of radiocarbon dating in the various disciplines, however. Each section is ably introduced and placed into a wider perspective by a preface.

The book begins with historical perspectives on the development of the technique presented by J.R. Arnold, R.L. Schuch, and H.E. Suess. These are personal narratives presenting details of the early efforts, and nicely giving the flavor of the pioneering work. I was unacquainted with the details of this history, and so found them valuable for their own sake, but they also serve as an excellent introduction to the following volume, and recount the excitement of the unique work being done during the development of radiocarbon dating.

In the next section, nine papers deal with aspects of the earth's natural carbon cycle and its relationships to deep ocean circulation, the geomagnetic field, and extra-terrestrial phenomena. Radiocarbon calibration and dendrochronology are also discussed in this section. For many archaeologists this and the next may become the most well-thumbed sections of the book, as understanding the calibration process, its physical basis, and the causes of radiocarbon fluctuations through time are becoming increasingly important. Stuiver and Pearson, for example, focus on extending a wood-based bi-decadal calibration curve back to 5000 B.C. using data from the Belfast and Seattle laboratories, while Sonett focuses his paper on examining short-term secular variation in radiocarbon, and the apparent causes rooted in solar activity. Both are concise, well-written papers that make important contributions to their subject.

The third section contains papers dealing with the technical processes involved in the use of radiocarbon, and sample treatment issues. I found three articles to be of particular value in this section. One is a succinct review by R.E.M. Hedges of sample treatment procedures, and their value for specific techniques and materials. The second is a brief history and comparison of AMS (accelerator mass spectrometry) techniques with the older decay counting techniques by H.E. Gove. The third is an elegant discussion of the precision and accuracy of AMS techniques by Roelf P. Beukens. All are welcome reviews of important topics in the application of radiocarbon techniques.

Hydrological uses of radiocarbon techniques are discussed in the next section. There are four papers dealing primarily with dating groundwater, error sources unique to this material, and the kinds of processes that can be and are elucidated by radiocarbon techniques. This is not an area of investigation that leaps to my mind when discussing radiocarbon, and it is obviously one presenting formidable complexity, but as amply demonstrated here, it is one with much to say about groundwater circulation and its environment.



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Archaeological articles are divided into two sections, one dealing with the Old World, and one with the New. With the exception of R.E. Taylor's article focusing on the use of bone, these articles are all retrospectives on the impact of radiocarbon dating in various parts of the world. For those of us suffering with a relatively recent departure from graduate school, it is easy to miss the profound impact of radiocarbon on our understanding of prehistory on a global scale. These articles very nicely demonstrate not only the serious, if not revolutionary, changes in an earlier generation's hard won theories, but also the newly acquired ability to build basic chronologies in areas that were previously intractable. Taylor's paper is an excellent, concise summary of the problems involved in dating bone using the Paleoindian period as a brief case study. He addresses both whole and collagen-fraction techniques and approaches, demonstrating that it does make sense to use bone for dating, at least when the difficulties are kept in mind.

A section of three papers on Earth Sciences looks at dating earthquakes and meltwater pulses via radiocarbon techniques. Palynology and its use of radiocarbon techniques is discussed by D.M. Peters.

Environmental issues are examined in a section of three papers, focusing on the distribution of radiocarbon in the atmosphere, and particularly human-induced changes caused by industrial gases and nuclear technologies. These papers focus clearly on understanding what can be gained by distinguishing and examining artificial sources of radiocarbon, not only for studies of atmospheric circulation, but also as a monitor of the anthropogenic impact on the natural world, and as a monitor of industrial impacts on human health.

The final section contains two articles that extend the range of radiocarbon utility to the biomedical field. They focus on the use of radiocarbon and other radioisotopes as tracers for a variety of carbon pathways in the human organism.

All told this volume provides an excellent mix of history, current levels of understanding, and promising future approaches. I found its scope and depth to provide a very satisfying retrospective on the techniques and their applications. In addition the volume is well put together, as is typical of both Springer-Verlag and *Radiocarbon*, and is happily free of egregious errors in typesetting, etc. I'm sure Dr. Libby would have been proud, although perhaps not surprised, given the scope of his own interests, to see his work contribute substantially to so many distinct fields of human endeavor.

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Organic Contents of Ancient Vessels: Material Analysis and Archaeological Investigations.

William R. Biers and Patrick E. McGovern (eds.). MASCA Research Papers in Science and Archaeology 9. MASCA, Philadelphia, 1990. $20.00 (paper).

Reviewed by Tania Oudemans, FOM Institute for Atomic and Molecular Physics, Kruislaan 407, 1098 SJ Amsterdam, The Netherlands

Most of the papers in this volume were presented at the symposium "Material Analysis: Contents of Vases," held in Baltimore in 1989 as part of the First Joint Archaeological Congress. The goal of the symposium was to evaluate the possibilities and limitations of the study of organic contents of ancient vessels and to encourage an interdisciplinary discussion between researchers from different countries. Although it becomes immediately evident that a selection of papers made in 1989 might need some updating in 1993, the book still manages to give a reasonable insight into the kind of work performed in organic residue analysis in archaeology.

"This volume can be seen as an introduction to organic residue analysis in ceramic studies. This introduction is not a complete review, though, for it lacks theoretical background of the position of organic residue analysis in archaeology and contains no literature reviews of earlier work done."

In chapter 1, John Evans discusses why he thinks three of the main problems of organic residue analysis have been "largely overcome." First of all, completeness of extraction is considered. Organic residues are preserved either as a solid crust on the inside of the vessel, or absorbed into the ceramic of the vessel. Since most analytical techniques are based on the analysis of liquids and gases, soluble compounds are usually extracted from the solid matrix. Evans claims that complete extraction can be satisfactorily reached by using a range of solvents with increasing polarity, each extracting specific classes of compounds. Although this is a valid concept, the data published so far by Evans and co-workers (Evans and Hill 1982; Hill and Evans 1989) did not give any comparative quantitative results of the various extraction phases, and conclusions were usually based on results from one or two solvents. Secondly, Evans considers contamination by exchange of organics with the soil "less serious than was first feared." This general statement needs some specification.

Although some compounds will not leach out of their burial matrix due to insolubility in water, others will be highly water soluble and quite easily exchanged with the soil. Only one quantitative study has been published on the migration of compounds between soil and residues (Heron et al. 1991). In this paper the authors declare that migration of extractable lipids probably exists but is not relevant when quantifying total lipid extracts. More work needs to be done before we can claim this problem overcome. Thirdly, Evans considers decomposition of organic compounds during burial "less serious than originally supposed." He suggests that carbonization itself would produce vesicles within which some of the original material becomes trapped. Absorbed materials might also be trapped and preserved within the ceramic of the pot. Evans' hypothesis is interesting but needs to be tested. It is becoming increasingly clear, though, that degradation of lipids, for instance, does occur in residues (Evershed et al. 1992; Oudemans et al. in press).

Shannon Fie et al. have used inductively coupled plasma spectrometry (ICP) to study trace elemental composition (chapter 2). In order to get a better insight into the harvest location and exchange of foods in Iroquois villages in Canada, five areas were defined and samples were taken from soils and locally grown corn. Residues were taken from sherds found in the same areas. The soils and corn samples correlated significantly with one another, but not with ancient residue samples. Using multiple regression analysis, however, all ancient residue samples could be explained by soil and corn samples from the same region, except for samples from one specific area. These latter samples could be explained by combinations of soil and corn samples from adjacent areas, suggesting that food was imported from those areas. This paper is a first attempt at understanding the regional exchange of organic goods. A major limitation is the needed variation in trace elemental composition between soils in studied areas. In addition, assumptions are being made that all residues are similar remains and that effects of secondary mineralization are irrelevant.

The third paper, by Virginia Bradley et al., deals with chemical evidence for wine in ancient ceramic vessels. Other researchers (Condamin and Formenti 1976) interpreted the presence of a mixture of tartaric acid and salts of tartaric acid (e.g., potassium salts) as chemical evidence for wine. Bradley et al. use Fourier transform-infrared (FT-IR) spectroscopy to analyze and compare acetone extracts of pot sherds with an L(+)tartaric acid standard. Based on visual comparison of the FT-IR spectra, they conclude that the extracts contain mainly tartaric acid in various isomeric forms and some salts of tartaric acid. The chemical evidence for this conclusion is limited and some major questions remain unanswered: (1) what is the explanation of differences between the IR spectra of L(+)tartaric acid standard and the sherd extracts; (2) what explains the absence of aromatic carboxylic acid, tannins and anthocyanodins (present in wine); and (3) why are the chosen extraction techniques employed? GC/MS (gas chromatography/mass spectrometry), for example, could positively identify the tartaric acid or its salts.

In chapter 4 Rolf Rottländer explains in clear terms why gas chromatography of lipids is potentially a very useful technique for the study of vessel contents. He states that lipids are present in most human foods and that they are relatively resistant to heating and decomposition over time. Experiments with methyl esters of fatty acids show that decomposition in open air (autoxidation) is not complete, but stops at 3–5% of the original amount of material. Rottländer also stresses the fact that carbohydrates (such as starch) and proteins start to decompose at much lower temperatures than fatty acids. Identification of archaeological materials is made by extracting potsherds and hydrolysing the lipids into their free fatty acids. After methylation, the fatty acid composition of the samples is compared to those from a reference collection of ancient and modern materials. Although lipids are potentially useful bio-markers, it has become more and more clear that the identification of a residue from its total fatty acid composition is probably not as simple as is suggested here. Many changes in total fatty acid composition can occur in archaeological samples due to decomposition processes such as oxidation, salt formation and hydrolysis by micro-organisms (Evershed et al. 1992; Oudemans et al. in press). Rottländer's optimism about the direct interpretation of total fatty acid composition ignores differences in burial circumstances. The employed analytical procedure can also be improved in order to include detailed information about intact acyl lipids, as has been shown by Evershed et al. (1990).

The fifth paper, by Klaus Gerhardt et al., reports on the analysis of lipids and resinous materials from three ceramic vases from the 6th century B.C. using GC/MS. GC/MS has recently become one the most frequently employed analytical techniques for the micro-analysis of complex organic mixtures in archaeology. The non-destructive sample extraction was done by filling the intact vases with organic solvents and pouring out the liquid containing the sample. Two of the vases possibly contained a mixture of fragrant plant materials and animal fats, which was interpreted carefully as perfumed oil, while the third vase contained a mixture of components interpreted as originating from cedarwood oil. The presence of many contaminants (such as phthalate esters) is probably partly caused by the extraction method.

In chapter 6, Curt Beck and Carl Borromeo study pine pitches found in ancient transport amphorae and as lining of ancient ships in order to discover whether differences in relative amounts of acidic and neutral compound reflect post-depositional differences or a variation in composition of the ancient materials. By studying several samples from one shipwreck this could be tested. A clear description of the various compound classes detected, such as terpenoid hydrocarbons, diterpenoid esters and normal alkanes, gives a good insight into the manufacturing technology

employed by people in the Hellenistic period. The pitch was not produced by heating pine resin but by pyrolysis of wood. The presence of normal alkanes is a result of mixing of the pitch with petroleum products. This would be the oldest instance of the use of petroleum in the manufacturing of pitch. How this relates to the taste of edible materials in the vessels is not addressed.

Rosemary Gianno et al. report in chapter 7 on five bulk samples of 15th century resins taken from several shipwrecks found in Asian waters and analyzed for identification. Three large storage jars contained a resin that was identified as Resin benzoin based on visual comparison of FT–IR spectra and GC/MS of archaeological samples and a reference spectrum of Styrax benzoin resin. Two other resins, a jar sealant and a hull caulk, were analyzed and identified as triterpenoid resins (no recent match could be found). The molecular composition of the resins is not discussed in spite of the use of GC/MS analyses, and the degree of similarity between recent reference resins and old samples could therefore not be calculated. Because no special attention was paid to possible effects of ageing on the FT–IR spectra and no reference spectra of aged resins were shown, it was hard to estimate the value of presented data.

In chapter 8, a combination of proton–induced x–ray emission (PIXE) spectroscopy, electron spectroscopic chemical analysis (ESCA) and FT–IR spectroscopy was applied by Patrick McGovern and Rudolph Michel to identify a dye stuff on ceramic sherds, suspected to be Royal Purple Dye (6,6'–dibromoindigotin). The combination of the various analytical techniques made it possible to exclude all other options of dye stuffs. Chemical and archaeological evidence is sound and complementary. The great methodological advantage of this work lies in the fact that a single compound had to be identified of which the identity was already suspected. To identify every compound in a complex organic mixture with various techniques, as is proposed by the authors, would be much more complicated.

This volume can be seen as an introduction to organic residue analysis in ceramic studies. This introduction is not a complete review, though, for it lacks theoretical background of the position of organic residue analysis in archaeology and contains no literature reviews of earlier work done. Only a few of the papers present extensive knowledge of prior research. This introduction published in 1990 is no longer complete, since there have been some recent developments in protein analysis and solid state techniques. Some protein work was performed by Von Endt in 1977, and more recent publications are starting to show the potential of amino acid analysis and immunological techniques in residue analysis (Fankhauser in press; Yohe et al. 1991). In order to prevent selective extraction or loss of sample during derivatization, several researchers have recently employed solid-state techniques such as pyrolysis (Shedrinski 1991; Oudemans et al. 1991) in the analysis of ancient vessel contents. Due to these instrumental improvements, the publication of more theoretical papers, and a development toward more detailed and careful archaeological interpretations of specific chemical results on decay and degradation, it is definitely time for a second volume on "Organic Contents of Ancient Vessels."

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□

An Investigation of Image Processing Techniques at Pincevent Habitation No. 1, A Late Magdalenian Site in Northern France.

Stephen Anthony Lang. Anthropological Research Papers 43, Arizona State University, Tempe, 1992.

Reviewed by Tim Church, Office of Contract Archeology, Lomas Branch, University of New Mexico

When I first flipped through this monograph I was excited. Someone else was exploring the same software tools and the same topic, image processing in archaeology, with which I have been tinkering.

The author's objective was to apply image processing techniques to a set of two–dimensional provenience data for artifacts at Pincevent Habitation #1. Specifically, the author, through the use of image processing techniques, tested the original investigators' (Leroi–Gourhan and Brézillon) spatial patterning hypothesis (i.e., placement of tents) and Binford's model of drop and toss zones.

The introduction discusses inter– and intra–site spatial patterning and set up the problem domain. The second chapter reviews basic image processing techniques fairly well with a minimum of technical jargon. This is of special note as few books present image processing in a straightforward manner (another good example is Schowengerdt 1983). The third chapter details the somewhat convoluted path the author took in transforming two-dimensional paper data into electronic form. First the artifacts were grouped into one of three categories: bone; chipping debris; and sandstone/limestone (SLSS). A grid size of 10 cm was then determined to be most appropriate. After an abortive attempt to digitize individual artifacts the author used a scanner to translate the paper map of the artifact locations into the computer. The following three chapters discuss the image processing techniques that were used to "Isolate the Scale of Interest," "Test the Outside Hearth Model" and finally "Test the Tent Structure Model." These chapters presented a number of images resulting from various filtering operations.

I agree with the author's critical summary of his own work. In the Conclusion, the author states:

> Image enhancement techniques were not successful with the Pincevent data, but could be very useful when studying phenomena with more pronounced linear components. Image reconstruction techniques were also not successful, but again would be useful in situations where the blurring effects of natural processes could be well modeled.

The bibliography is not all that extensive and lacks several references that readers might find interesting (Fabbri 1986; Lieberman et. al. 1990; O'Brien et. al. 1982; Rip 1983; and Haigh and Ipson 1989, for examples of interesting applications of image processing). Finally the author includes the code for a number of small translation and utility programs that he wrote during the course of his research. These may be useful for us computer nerds but not for the majority of readers.

The author's exploration of these new tools and techniques as applied to archaeology is commendable. However, I question the use of image processing for this type of data. After much computer manipulation, importing and exporting data to a variety of software programs and hardware platforms, it seems to me that the same results were possible with much more traditional, low-tech methods. After all, the basic goal of the investigation was to seek patterns in the locations of different types of artifacts. I cannot help but feel that a simple overlay of the locations of each artifact over a base map would have produced the same, or better, results.

This leads me to question the general value of "scientific visualization." In the "hard" sciences these techniques have enabled researchers to visualize *very complex* data sets and events. I emphasize 'very complex' because the vast majority of archaeological data is seldom on the same order as modelling hurricanes or plasma jets. The trouble is that there is the real danger of authors including all sorts of diagrams and pictures, or fluff illustrations, for the wrong reasons, either to impress readers, or out of a sense that unless they do so their work will not be viewed by colleagues as state of the art science. An example of what I consider fluff illustrations appears in the monograph under review. On page 28, figure 4.3 is captioned, "Three–dimensional power spectra of raw Pincevent images." This illustration consists of three mesh diagrams of the data for bone, chipping debris and SSLS without any indication as to the significance or interpretation of the illustration. The text does discuss the illustration and the author concludes that the diagrams do not show significant peaks. This is all well and good but did the readers need to see diagrams that show nothing significant?

With the advent of computers we can generate impressive-looking charts and diagrams at the click of a mouse. But just because we can produce them does not mean we should publish them. Do we publish every dead–end computation we make during our analysis? No, of course not. Why then should "scientific visualizations" be any different? Before we include any illustration in our reports we need to ask the question: why am I including it? And is the illustration technique employed the best in representing the information? I would urge all readers to sit down with any number of articles (Spicer 1987, for one) that can be found in the statistical and geographic literature about the pitfalls of graphical representation of data.

On a historical note, Pincevent has been the subject of spatial analysis by at least four other investigators (Johnson 1984; Simek and Larick 1983; Djindjian 1988; and Carr 1991). Overall, if you're interested in artifact distribution at Pincevent Habitation #1, this monograph will provide no new information. However, if you're interested in image processing applications in archaeology then I'd recommend you look this publication over. While I and the author agree that image processing did not significantly help in this case, the procedures are well presented and may serve to steer others away from the pitfalls the author encountered.

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Science for Life - The COPUS/SERC (Committee on the Public Understanding of Science/Science and Engineering Research Council) Conference for Scientists and the Media

Book Reviews

A History of Metallurgy
Metals in Society
Recent Trends in Archaeometallurgical Research
Early Animal Domestication and its Cultural Context
Animal Use and Culture Change

Meetings Calendar

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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., "15(1):2" for volume 15, number 1, page 2.

1994

Jan. 5-9. Annual Meeting, Society for Historical and Underwater Archaeology. Vancouver, British Columbia. David V. Burley, Department of Archaeology, Simon Fraser University, Burnaby, BC, V5A 1S6, Canada.

Jan. 5-9. 15th Indo-Pacific Prehistory Association Congress. Ubon Ratchathani, Thailand. Dr. Peter Bellwood, Department of Prehistory and Anthropology, ANU CPO Box 4, Canberra ACT 2601, Australia.

* Jan. 27-28. Remote Sensing and GIS International Conference. Ottawa. Vern Singhroy, Canada Centre for Remote Sensing, 588 Booth Street, Ottawa K1A 0Y7, Canada; tel 613-947-1215; fax 613-947-1385.

* Feb. 1-3. Geology of the Nile Basin Countries, International Meeting. Assiut, Egypt. Hassan A. Soliman, Geology Department, Faculty of Science, Assiut, Egypt; fax 002-088-5123.

Feb. 2-4. Fifth Australian Archaeometry Conference. Armidale, New South Wales. Nick Cook, Department of Archaeology and Palaeoanthropology, The University of New England, Armidale, NSW 2351, Australia; tel 067-73-2860; fax 067-73-2526; e-mail ncook@metz.une.edu.au. A series of special discussion sessions and workshops for archaeologists on various methods and sampling is intended.

Feb. 18-23. American Association for the Advancement of Science, Annual Meeting. San Francisco. AAAS, 1333 H Street NW, Washington DC 20005, USA; tel 202-326-6400.

Feb. 27-March 4. Pittcon '94: The Pittsburgh Conference & Exposition on Analytical Chemistry and Applied Spectroscopy. Chicago. Alma Johnson, Program Secretary, The Pittsburgh Conference, 300 Penn Center Boulevard, Suite 332, Pittsburgh, PA 15235-5503, USA; tel 412-825-3220. Symposium topics include: elemental mass spectrometry; advances in fluorescence; surface mass spectrometry.

Feb. 28-Mar. 4. Archaeological Curation and Collections Management. Washington, DC. The George Washington University, Division of Continuing Education, Center for Career Education and Workshops, 2020 K Street NW, Suite B-100, Washington DC 20052, USA; fax 202-293-2650.

March-April. Cultural Resource Management courses, 1993-94. Reno, Nevada. Cultural Resource Management, Division of Continuing Education/048, University of Nevada, Reno, NV 89557-0024, USA. Courses include: Faunal Analysis, March 9-11, $325, registration deadline 2/9/94; Geomorphology in Archaeological Analysis, April 5-9, $525, registration deadline 3/7/94; Geographic Information Systems in Archaeology, April 18-19, $250, registration deadline 3/21/94.

March 1-4. 7th Australasian Remote Sensing Conference. Melbourne. 7th ARSC, Conference Secretariat, PO Box 29, Parkville, Victoria 3052, Australia; tel 613-387-9955; fax 613-387-3120; e-mail 7arsc@dar.csiro.au.

* March 4-6. Archaeology of the Hudson Valley Conference. Albany, New York, USA. Cheryl Claassen, Department of Anthropology, Appalachian State University, Boone, NC 28606, USA; tel 704-262-2295.

* March 19-21. From the Inside and the Outside: Interdisciplinary Perspectives on the History of the Earth Sciences; Geological Society of America Penrose Conference. San Diego, California, USA. Leo F. Laporte, Earth Sciences Department, University of California, Santa Cruz 95064, USA; tel 408-459-2248; fax 408-459-3074.

* March 23-24. Landscape Ecology Meeting. Tucson, Arizona. Margaret M. Moore, Box 15018, School of Forestry, Northern Arizona University, Flagstaff 86011, USA; tel 602-573-7457.

April 2-6. Association of American Geographers Annual Meeting. San Francisco. Association of American Geographers, 1710 16th Street NW, Washington DC 20009, USA; tel 202-234-1450.

April 4-11. William Robertson Smith Congress. Aberdeen. William Johnston, Department of Hebrew and Semitic Languages, University of Aberdeen, King's College, Old Aberdeen AB9 2UB, Scotland, UK.

* April 7-9. 2nd International Conference on Pedo-Archaeology. Columbia, South Carolina. A.C. Goodyear, SCIAA-USC, 1321 Pendleton Street, Columbia, SC 29208, USA; tel: 803-777-8172; fax 803-254-1338.

* April 8-9. Integrating Archaeological Demography: Multidisciplinary Approaches to Prehistoric Population. Carbondale, Illinois. Richard R. Paine, Center for Archaeological Investigations, Southern Illinois University, Carbondale, IL 62901, USA; tel 618-549-4009; fax 618-453-5037.

April 11-13. International Conference, Wetland Archaeology and Nature Conservation. Bristol, UK. Margaret Cox, Somerset Levels & Moors Archaeologist, Department for the Environment, Somerset County Council, County Hall, Taunton TA1 4DY, UK; tel 0823-255416; fax 0823-334343.

April 11-15. Materials Research Society, Spring Meeting. San Francisco. Materials Research Society, 9800 McKnight Road, Pittsburgh, PA, USA; tel 412-367-

3012. Symposium: Materials Issues in Art and Archaeology IV.

April 13-18. 3rd International Conference, The Birth of Metallurgy. Sanmenxia City, China. Prof. T. Ko, Institute of Historical Metallurgy, University of Science and Technology, Beijing 100083, China; tel 861-2019944; fax 861-2017283.

+ April 20-24. Society for American Archaeology 59th Annual Meeting. Anaheim, California. Society for American Archaeology, 1511 K Street NW, Washington, DC, USA; tel 202-223-9774.

April 25-29. European Geophysical Society, XIX General Assembly. Grenoble, France. EGS Office, Postfach 49, Max-Planck-Str. 1, 37189 Katlenburg-Lindau, Germany; tel 49-5556-1440; fax 49-5556-4709; e-mail EGS@LINMPI.DNET.GWDG.DE . Symposia include: Geophysics and the ancient environment (convenor, S. Papamarinopoulos). Abstract deadline: 1 Jan. 1994.

May 5-8. 1994 International Congress on Medieval Studies; symposium of Medieval Metal and Metallurgy. Kalamazoo, Michigan, USA. Dr. Alan Stahl, American Numismatic Society, Broadway at 155th Street, New York, NY 10032, USA; tel 212-234-3130; fax 212-234-3381.

May 9-14. Archaeometry 94: 29th International Symposium on Archaeometry. Ankara. Prof. Dr. Ay Melek Ozer, Middle East Technical University, Department of Physics, 06531, Ankara, Turkey; fax 90-4-210-12-81. 16:3(15).

May 16-18. Geological Society of Canada, Annual Meeting. Waterloo, Ontario. Geological Association of Canada, Department of Earth Sciences, Memorial University of Newfoundland, St. John's Newfoundland, A1B 3X5 Canada. Sessions include: Techniques for reconstructing Quaternary paleoclimates.

May 16-20. Materials Issues in Art and Archaeology IV. Cancun, Mexico. James R. Druzik, The Getty Conservation Institute, 4503 Glencoe Avenue, Marina del Rey, CA 90292, USA; tel 310-822-2299; fax 310-821-9409.

May 17-21. International Conference on Tree Rings, Environment, and Humanity: Relationships and Processes. Tucson, Arizona. International Conference on Tree Rings, Laboratory of Tree-Ring Research, Building 58, University of Arizona, Tucson, AZ 85721, USA; tel 602-621-2191; fax 602-621-8229. 16:3(15).

May 25-29. 20th Annual Conference and Pre-Conference Training Workshop, International Institute for Conservation - Canadian Group. Toronto. Iona McCraith, IIC-CG Conference '94, Toronto Area Conservation Group, PO Box 956, Station F, Toronto, Ontario M4Y 2N9, Canada; tel 416-327-1521; fax 416-327-1999. Abstract deadline: 31 Dec. 1993.

May 30-June 4. International Rock Art Congress. Flagstaff, Arizona, USA. 1994 IRAC-ARARA, PO Box 65, San Miguel, CA 93451-0065, USA; tel 805-467-3704; fax 800-467-2532. Symposia tentatively planned include: Preservation and conservation; Advances in dating techniques; Archaeoastronomy.

June 5-11. Geochronology, Cosmochronology and Isotope Geology (ICOG-8). Berkeley, California. Garniss H. Curtis, Institute of Human Origins-Geochronology Center, 2453 Ridge Road, Berkeley, CA 94709, USA; tel 415-845-4003; fax 415-845-9453.

* June 6-11. 22nd Annual Meeting, American Institute for Conservation of Historic and Artistic Works. Nashville, Tennessee. AIC, 1717 K St., NW, Suite 301, Washington, DC 20006, USA; tel 202-452-9545.

June 12-16. Fifth International Conference on Ground Penetrating Radar. Kitchener, Ontario. GPR '94, Waterloo Centre for Groundwater Research, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada; tel 519-885-1211; fax 519-725-8720.

June 19-22. American Quaternary Association (AMQUA), 13th Biennial Meeting. Minneapolis. Limnological Research Center - AMQUA, University of Minnesota, 310 Pillsbury Drive S.E., Minneapolis, MN 55455-0219, USA. Theme: Data and models in Quaternary research. Field trips include: Archaeological sites in southern and southwestern Minnesota.

June 19-24. American Nuclear Society Annual Meeting. Atlantic City, New Jersey. ANS, Meetings Department, 555 N. Kensington Avenue, La Grange Park, IL 60525; tel 312-352-6611.

July 5-9. 7th International Specialist Seminar on Thermoluminescence and Electron Spin Resonance Dating. Krems an der Donau, Austria. Norbert Vana, Atominstitut, Schuttelstrasse 115, A-1020 Vienna, Austria.

July 10-16. 15th International Congress of Soil Science. Acapulco, Guerrero, Mexico. Dr. Roberto Nulez, Colegio de Postgraduados, Centro de Edafología, Km. 34, Carretera México-Texcoco, Montecillo, C.P. 56230, México; tel 52-595-557-1; fax 52-595-4-57-23.

Aug. 8-12. LSC 94 - Advances in Liquid Scintillation Spectrometry. Glasgow. LSC 94, c/o Dr. G.T. Cook, Scottish Universities Research and Reactor Centre, East Kilbridge G75 0QU, Scotland, UK; tel 44-3552-23332; fax 44-3552-29898. The aims of the conference are to promote and encourage the free exchange of information on liquid scintillation spectrometry and related scintillation techniques. Abstract deadline: Dec. 1993.

Aug. 15-19. 15th International Radiocarbon Conference. Glasgow. The Secretariat c/o Mrs. M. Smith, Department of Statistics, University of Glasgow, Glasgow, G12 8QW, Scotland, UK; tel 44-41-339-8855 x5024; fax 44-41-330-5094; e-mail Gata24@UK.AC.Glasgow.VME. 16(3):16.

Aug. 21-26. 14th International Sedimentological Congress. Recife, Brazil. 14th International Sedimentological Congress, Caixa Postal 7801 Cidaded Universitaria, 50739 Recife PE Brazil; tel 081-271-82-40.

Aug. 23-27. Xth Congress of the International Federation of the Societies of Classical Studies.

Quebec City. X Congres de la FIEC, Cabinet du Doyen, Faculte des Lettres, Universite Laval, Quebec City, Quebec G1K 7P4, Canada.

Sept. 22-24. Symposium: Application of Scientific Methods for Investigating Coins and Coinage. London. Miss K. Havercroft, Department of Conservation, The British Museum, London WC1B 3DG, UK; tel 071-323-8223.

October. Cities on the Sea Symposium. Nicosia, Cyprus. Stuart Swiny, Director, CAARI, 11 Andreas Demitriou, Nicosia 136, Cyprus; fax 357-2-461-147.

* Oct. 4-6. The Art of the Greek Goldsmith. London. Dr. Jack Ogden, Cambridge Centre for Precious Metal Research, PO Box 391, Cambridge CB5 8XE, UK; fax 0223-565182.

Oct. 4-7. Annual Meeting German Geological Society. Heidelberg, Prof. Th. Bechstadt, Geologisches-Paläontologisches Institut, Ruprecht-Karls-Universität, Im Neuenheimer Feld 234, D-6900 Heidelberg, Germany; tel 0-62-21-56-55-31.

\+ Oct. 14-16. Science and Archaeology: A Multi-Disciplinary Approach to Studying the Past; sponsored by the SAS. Cambridge. Robert H. Tykot, Archaeometry Laboratories, Harvard University, Cambridge, MA 02138, USA; tel 617-496-8991; fax 617-495-8925; e-mail Tykot@HUSC4.Harvard.Edu. 16(2):21.

Oct. 24-27. Geological Society of America, Annual Meeting. Seattle, Washington. Geological Society of America, 3300 Penrose Place, Boulder, CO 80301, USA; tel 303-447-2020.

* Nov. International Symposium: The Pleistocene/Holocene Boundary and Human Occupations in South America. Mendoza, Argentina. Marcelo Zarate, International Symposium on the Pleistocene/Holocene Boundary, Centro de Geología de Costas y del Cuarternario - UNMP, Casilla de Correo 722 - Correo Central, 7600 Mar del Plata, Argentina.

Nov. 3-5. Imaging the Past: Electronic Imaging and Computer Graphics in Museums and Archaeology. London. Dr. Peter Main, Department of Scientific Research, The British Museum, Great Russell Street, London WC1B 3DG, UK; tel 44-71-323-8959; fax 44-71-323-8276; e-mail EZBMPLM@UK.AC.ULCC.

* Nov. 12-14. Symposium, Wooden Artifacts Group. Williamsburg, Virginia, USA. Valerie Dorge, The Getty Conservation Institute, 4503 Glencoe Ave., Marina Del Rey, CA 90292, USA; tel 310-822-2299; fax 310-821-9409.

Nov. 30-Dec. 2. American Anthropological Association, Annual Meeting. Atlanta, Georgia, USA. American Anthropological Association, 1703 New Hampshire Avenue NW, Washington DC 20009, USA; tel 202-232-8800.

Dec. 4-11. Third World Archaeology Congress. New Delhi, Shri M.C. Joshi, Director General, Archaeological Survey of India, Janpath, New Delhi 110011, India; tel 91-11-3014821; fax 91-11-3019821.

1995

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

* April 2-7. Archaeological Chemistry Symposium, American Chemical Society National Meeting; sponsored by the Subdivision of Archaeological Chemistry, Division of the History of Chemistry, ACS. Anaheim, California. Mary Virginia Orna, Department of Chemistry, College of New Rochelle, New Rochelle, NY 10805, USA; tel 914-654-5302; fax 914-654-5387. Major areas of interest: bone dating; artifact dating; archaeology of genetic material; peopling of the New World. Abstract deadline: 15 June 1994.

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

Greece (continued from p. 5)

sites. The co-operation of the museums with telecommunication and new information technologies has created a number of multimedia databases that can be used in research and education. These electronic tools have integrated computer graphics, visualization, modeling, image processing and 2- or 3-dimensional mapping for describing and interconnecting findings with their spatial and thematic context. The products of this synthesis constitute electronic guides for searching and navigating through the data, including the exploration of different aspects of the archaeological material.

The Goulandri-Chorn Foundation and the Lambrakis Research Foundation have organized a series of lectures on the subject "Information Technology - Humanistic Sciences and Arts" between November 1993 and April 1994. The lectures present the main accomplishments of the information technologies in the area of the humanistic sciences, including history, philosophy, linguistics, archaeology, museum science, music, education, and arts. Contributors will investigate the applications of technology in geophysical prospection and the excavation process of archaeological sites, and the use of information technology in the creation of interactive databases describing the archaeological materials from museums, archaeological sites, and private collections.

Contributed by Dr. Apostolos Sarris, 22 Agiou Nikolaou St., Glyfada, Athens 16675, Greece; tel 30-1-86-22-508, 30-1-96-48-820 □

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