

SAS

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NEWSLETTER

SOCIETY FOR ARCHAEOLOGICAL SCIENCES

NEWS OF THE PROFESSION

NEWS OF ARCHAEOMETALLURGY

The Historical Metallurgy Society and the British Museum sponsored a two-day Seminar on Ancient Furnace Technology in London in October 1982 with many participants from both eastern and western Europe. It was organized by Paul Craddock and Michael Hughes of the British Museum Research Laboratory. Among the contributors was J. R. Marechal, whose first paper in this field was published in 1924. Excavation reports of furnaces were supplemented by reports of replication experiments and iconographic studies. W. A. Oddy's paper focused critically on the interpretation of Greek vase paintings such as the famous Berlin Foundry Cup. John Merkel's experiments reproducing the copper smelting technology of Timna, where manganese slags supplanted fayalite, demonstrated that such a slag after only a half hour cooling would no longer adhere to itself and therefore the plates of ropey slag found at Timna indicate a process of continuous tapping of the slag. In fact an important aspect of this meeting was the attention given to slag and other scoria. Professor Hans-Gert Bachmann's monograph "The Identification of Slags from Archaeological Sites" has been published (1982) by the Institute of Archaeology as Occasional Paper No. 6. It is available from the Institute of Archaeology, University of London, 31-34 Gordon Square, London WC1H 0PY. In addition to the text and extensive bibliography, it contains 33 pages of plates, some in color.

The proceedings of the Seminar in Ancient Furnace Technology will be edited by Paul Craddock and is to be published by the British Museum as one of its Occasional Papers. Supplies of the Occasional Paper No. 15 on "Aspects of Tibetan Metallurgy," edited by W. A.

Oddy and W. Zwalf, are nearly exhausted. "Aspects of Early Metallurgy," Occasional Paper No. 17, edited by W. A. Oddy, has been out of print but is being republished. British Museum Occasional Papers can be obtained from Occasional Papers, Secretariat, British Museum, Great Russell Street, London WG1B 3DG.

Dean Robert A. Coughenour of Western Theological Seminary, Holland, Michigan presented a paper at the Furnace Meeting on the iron mine and smelting site at Mugharat el Wardeh in the Ajlun district of Jordan, where he found a 30-ton slab of slag in which were embedded parallel rows of tuyeres. This site was one suggested as the source for the early Iron Age (1200-1050 BC) steel excavated by Dr. Patrick E. McGovern of MASCA in the Baq'ah Valley of Jordan. Samples of the 11 objects and 40 fragments of mild steel are now being studied at MASCA by Vincent Pigott. Whether or not this steel was a local product was a lively topic at MASCA's Fall Meeting on The Archaeology of Jordan.

The British Museum had several temporary exhibits on archaeometallurgy last spring and summer, including one on the object identified by Paul Craddock as being Corinthian gold which he reported on at the Archaeometry meeting at Brookhaven. His paper on "Gold in Antique Copper Alloys" has been published with illustrations in color in the *Gold Bulletin* of April 1982, volume 15: 69-72.

The American Society for Metals has a Committee on the History and Archaeology of Materials. This Committee presents symposia, the last of which was organized by Professor Wendell S. Williams of the University of Illinois at Urbana-Champaign. At this symposium, held in Atlanta in 1981, Jeffrey Wadsworth and Oleg D. Sherby presented a paper on Dam-

ascus steel which was reported by Thomas H. Maugh II in *Science* (8 January 1982, p. 153). This report led to an exchange of letters with Cyril Stanley Smith (*Science* 16 April 1982, p. 242 and volume 218, pp. 328-329) and renewed interest in the topic. Wadsworth and Sherby relate the newly-developed high-carbon steels to the Damascus steel as prepared from wootz, not pattern welding. Their work has been published in the *Bulletin of the Metallurgical Museum (Japan)* 4 (1979) 7, and in *Progress in Material Science* 25 (1980) 35.

Martha Goodway visited Iceland in search of Norse iron blooms to be compared with the Smithsonian's Frobisher bloom, which has been dated to ca. 1200 A.D. (E. V. Sayre et al., "Carbon-14 Dating of an Iron Bloom Associated with the Voyages of Sir Martin Frobisher," in L. A. Currie, ed., *Nuclear and Chemical Dating Techniques, Interpreting the Environmental Record*, ACS Symposium Series 176, 1982, pp. 441-451) and found two blooms in the National Museum in Reykjavik. Both blooms are "split" blooms, being cleft nearly apart in one or more places, which accords with observations of Norse blooms in Norwegian museums by Dr. Garman Harbottle of Brookhaven National Laboratory. All the Norwegian blooms are split blooms. A more important discovery, however, was that of a chemist, Dr. Thornbjörn Fridriksson, Degranesvegi 26, Kopsvokur, who has identified more than 150 iron smelting sites in Iceland, some of which he has excavated. The indigenous iron making industry in Iceland dates from settlement in the 10th century to its decline in the 17th. A monopoly in iron importation awarded in 1615 led to its extinction within fifty years: The sites are of two types, one isolated

and used once or infrequently, and the second a permanent installation located on a farm or estate.

Prentiss de Jesus of Alexandria, Virginia, has started analytical work on a large corpus of samples of Egyptian metals dating from the Old Kingdom forward and from a wide distribution of sites.

Professor Ronald F. Tylecote of the Institute of Archaeometallurgical Studies (IAMS) wishes to identify persons interested in archaeometallurgy. His address is IAMS, Institute of Archaeology, 31-34 Gordon Square, London WC1H 0PY. Professor Tylecote is Honorary Editor of the journal *Historical Metallurgy* published by the Historical Metallurgy Society. Membership for individuals is £6.00 per year, sent to Ian J. Standing, Honorary Treasurer, Rock House Bowen's Hill, Coleford Glos. GL16 8DH England.

Professor Robert Maddin of the University of Pennsylvania plans to retire at the end of 1983 to devote full time to his studies in archaeometallurgy.

A number of scholars took part in the CMRAE Summer Institute on Materials in Ancient Societies: Metals, which was taught at MIT by Professor Heather Lechtman, with guest lectures by Arthur Beale of Harvard and Cyril Stanley Smith of MIT. Participants included: William Eamon (Dept. of History, New Mexico State Univ.), Joan Gardner (Carnegie Museum of Natural History, Pittsburgh, PA), Barbara Hall (The Oriental Institute, Univ. of Chicago), Ellen Howe (Metropolitan Museum of Art, NY), Adria La Violette (Dept. of Anthro., Washington Univ., St. Louis, MO), Judith Levinson (Fogg Museum, Harvard Univ.), Janet Levy (Dept. of Soc. & Anthro., Univ. of North

SAS Newsletter

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Dr. G. Kuppuram, a lecturer in the Department of Ancient Industries of Tamil University in India (Science Faculty, Thanjavur-613 001, Tamilnadu) is beginning work on ancient Indian metallurgy and would like to correspond with specialists in ancient metallurgy.

Jordan now has its first archaeometallurgist. He is Dr. Lutfi Khalil, a graduate of the IAMS now teaching at the University of Jordan, Department of Archaeology, in Amman.

Dr. Jerzy Piaskowski of the Instytut Odlewnictwa in Cracow (ul. Zakopianska 73) has produced a monograph "Technologia Dawnych Odlewów Artystycznych," published by the Institute in 1981 on the history of casting statuary, bells and the like. Included are tables of alloy compositions, microstructures, and figures from many Polish sources.

Theodore A. Wertime, the author of *The Coming of the Age of Steel* (Chicago 1962) and editor with James D. Muhly of *The Coming of the Age of Iron* (New Haven 1980) died on the eighth of April. He organized the seminar "Early Pyrotechnology: the Evolution of the First Fire-Using Industries," which was held in Washington in 1979. The proceedings have just been published by the Smithsonian Institution Press, and they are dedicated to his memory. Information on ordering copies can be obtained from Mrs. Jacqueline S. Olin, Conservation-Analytical Laboratory, Smithsonian Institution, Washington, DC 20560.

A colloquium on Early Iron Metallurgy in the Eastern Mediterranean was organized by James D. Muhly of the University of Pennsylvania as a part of the annual meeting of the American Institute of Archaeology held in Philadelphia 27-30 December 1982. The AIA Science-in-Archaeology Fair had Ancient Metallurgy as its theme for this meeting. The Pomerance Award of the AIA for Scientific Contributions to Archaeology was awarded to Professor Cyril Stanley Smith of MIT.

Meetings announced for 1983 include the Journées de Paleometallurgie, 22-23 February at the Université de Compiègne. For information write Madame Catherine LaCroix, Univer-

site de Technologie de Compiègne, Cabinet BP233, 60206 Compiègne Cedex, France.

MASCA has announced that its Spring Symposium on 26 February at the University Museum in Philadelphia will be devoted to archaeometallurgy in China. Information may be obtained from Helen Schenck, Administrative Coordinator, MASCA, The University Museum, 33rd and Spruce Streets, Philadelphia, PA 19104.

An international symposium on Electron Optical and Microchemical Analysis of Art and Archaeological Artifacts has been announced by LeHigh University for 23-24 June. A basic five-day short course in analytical techniques (SEM, EPMA, STEM) will be offered the week prior, and an advanced course at the beginning of, the week of the symposium. Registration for these courses should be submitted by May 1st. Abstracts for the symposium are due April 1st. For information write Professor Michael R. Notis, Department of Metallurgy and Materials Engineering, Whitaker Laboratory #5, LeHigh University, Bethlehem, PA 18015.

Please send news items, corrections, comments and announcements relating to archaeometallurgy to: Martha Goodway, Conservation-Analytical Laboratory, Smithsonian Institution, Washington, DC 20560.

Martha Goodway, Smithsonian Institution

SEMINAR ON PEST CONTROL IN CULTURAL INSTITUTIONS

The detection and identification of insects, bugs, and other pests, and how the treatment and control of these pests can be carried out without endangering museum, archival, library, and historical collections, or personnel, will be realistically addressed in PEST CONTROL, PROTECTING CULTURAL PROPERTIES, an intensive seminar to be held on 23-24 April 1983 at the Massachusetts Institute of Technology. This 2-day meeting, sponsored by Technology & Conservation and the MIT Museum, is designed to provide museum, library, archives, historic society, and art gallery administrators, curators, conservators, and others responsible for cultural/historic holdings with a broad overview of the commonly encountered flying and crawling insects and other pests that can damage and/or destroy works of art, books and manuscripts, archaeological artifacts, and related objects. The seminar then will examine various extermination treatments and control measures that are

available, with the feasibility of these techniques assessed in terms of human safety/health and effect on collection materials.

Fumigation chemicals and equipment will be covered along with the basic principles involved in designing a useful and usable fumigation facility. Alternative pest elimination methods and budgetary considerations also will be discussed. Several case histories will be presented which illustrate different pest control approaches that have proved successful in various cultural facilities. In addition, there will be a panel discussion on recent research in the pest control field as well as tours of a fumigation facility and of a related area.

Registration fee is \$130 per person (\$110 prior to 10 March). The fee includes two luncheons, a reception, tours, and seminar materials. For further information, contact **Technology & Conservation**, 1 Emerson Pl., Boston, MA 02114, 617-227-8581, or the MIT Museum, MIT, N52-260, Cambridge, MA 02139, 617-253-4444.

CONTRACT ABSTRACTS

In early 1983 **Contract Abstracts** will begin publishing a special section of papers in each issue, to be called "Scientific Studies in Archeology." We invite all members of the SAS to submit papers for the first appearance of this section.

Papers should follow **American Antiquity** guidelines, and be submitted in two copies to: **Contract Abstracts**, P.O. Box 3631, Albuquerque, NM 87110. The submission deadline is 30 January 1983.

Contract Abstracts is a professional journal, to date focused on North American archaeology. However, the editors are more concerned that articles be of general professional interest and/or use, than that the original research have been done in North America or as part of a contract. There are no restrictions, therefore, on either area or origin of research.

NEWS OF THE SOCIETY

REQUESTS FOR COOPERATION

Dating

Ian K. Bailiff writes that his thermoluminescence lab will launch a TL Dating Service for archaeologists in mid-1983. They have financial support for the project and are in the process of appointing an assistant to perform the work. Details are available upon request. Address: TL Laboratory, Department of Archaeology, 46 Saddler Street, Durham DH1 3NU, England.

The **Aegean Dendrochronology Project** is analyzing wood or charcoal specimens from all periods (Neolithic to present) from the Eastern Mediterranean. If you know of suitable material, please contact: Peter Ian Kuniholm, Department of Classics, 121 Goldwin Smith Hall, Cornell Univ., Ithaca, NY 14853.

Archaeobotany

Michael J. Andrejko is compiling a list of procedures presently or previously in use for separation, extraction, or removal of phytoliths from plants, soils, sediments, etc., and on mounting media used. He has a publisher for the compendium and would like to receive contributions from other specialists. Each en-

try will be listed according to the original author and/or person who abridged it. Address: Los Alamos National Laboratory, ESS-2, MS-K-586, Los Alamos, NM 87545.

Metallurgy

Helen Schenck welcomes samples of any iron-working residues from well-defined archaeological contexts. Address: University Museum, 33rd and Spruce Streets, Philadelphia, PA 19104.

Remote Sensing

James I. Ebert requests that persons involved in the use of aerial photography, photointerpretation, photogrammetry, or other remote sensing applications in archaeology and/or cultural resources management contact him for inclusion of their ongoing work in his book, **Archaeological Applications of Remote Sensing**. It will appear in a series on remote sensing applications through Martinus (The Hague). He is convinced that the utility of such a text depends on its containing up-to-date applications methods illustrated with verbal and visual materials detailing the techniques used and results obtained. Address: Remote Sensing Branch, National Park Service, P.O. Box 26176, Albuquerque, NM 87125.

SAS RESEARCH REPORTS

NUMBER 3

WINTER 1983

THE NORTH AMERICAN PRE-CLOVIS: CHRONOLOGICAL AND ARCHAEOLOGICAL EVIDENCE

Louis A. Payen
Radiocarbon Laboratory
Department of Anthropology
University of California, Riverside

In spite of over 100 years of lively, often bitter, controversy among American archaeologists, just when human populations first reached the New World remains unresolved. A projectile point-using, megafauna-hunting people, described as the Clovis culture, has been well documented from sites dating to approximately 11,250 radiocarbon years ago. While the Clovis materials provide indisputable evidence of a terminal Pleistocene occupation of the New World, the origin of these people remains elusive. The contention that Clovis represents the initial colonization of the Western Hemisphere from Asia and, in the process, was responsible for the extinction of large Pleistocene animals, such as the mammoth, has been criticized by some for not taking into consideration the full range of evidence now available. Such critics insist that there are sufficient data to support the existence of a widespread pre-Clovis occupation. No less than 70 alleged pre-Clovis sites and complexes have been reported for North America, ranging from the Old Crow Basin in the Yukon to the central desert of Baja California.

The problem of pre-Clovis manifestations has been examined in terms of two major lines of evidence: chronological and cultural. Turning first to the temporal evidence, a compilation has been made of available information used in the dating of the various proposed pre-Clovis localities. Over the years an impressive array of techniques has been employed, including radiocarbon, amino acid racemization, obsidian hydration, fission track, thermoluminescence, uranium series, lithic surface alterations, and geological/geomorphological criteria. This has resulted in a massive amount of chronometric data. For example, over 300 radiocarbon determinations bearing on this is-

sue have been published. In order to evaluate critically the validity and significance of these data, it was necessary to take into consideration both the dating mechanism, i.e., how the temporal information was obtained, and sample context, i.e., how the dating evidence actually relates to the presumed archaeological materials being investigated. On these bases, it has been possible to clarify some of the ambiguities and sometimes conflicting assertions concerning the time placement of particular sites. The result of this aspect of the study has been to support the argument that several alleged pre-Clovis assemblages can be assigned ages greater than about 12,000 radiocarbon years B.P. In fact, several of these sites appear to have considerable antiquity. For example, the sediments in which flaked stone specimens occur at the Calico Site (California) or at the Medicine Hat locality (southern Alberta), appear to date to pre-Wisconsin times. On the other hand, there are a number of sites where the temporal evidence remains equivocal due to the existence of anomalies in the dating evidence. In this class is the problem of contamination of charcoal with older organics at the Meadowcroft Rockshelter (Pennsylvania). In other cases, sample contexts are seriously anomalous to such a degree to make it impossible to link the dating evidence with a particular assemblage with any degree of confidence. The Manix Lake Industry represents a good illustration of this problem. In still other examples, the dating is entirely lacking such as with the Black's Fork assemblages reported from river terraces in Wyoming. However, in some cases, such as at Potter Creek Cave in northern California, it has been possible to demonstrate that the artifacts are of late Holocene age.

Evaluation of the pre-Clovis cultural evidence has been more difficult due to the problem of the discrimination between artifacts and geofacts. Certain classes of alleged cultural evidence such as modified bone and fire hearth-like features have been poorly documented. It is well understood that both can result from natural agencies. On this basis, cultural evidence from such sites as Old Crow (Yukon) and Santa Rosa Island (California) remain extremely equivocal. By far the largest class of pre-Clovis evidence, however, is represented by flaked stone specimens. To attempt to objectively discriminate artifact from non-artifact populations of chipped lithic specimens, the Barnes test has been employed. This technique involves the measurement of populations of striking platform-flake scar angles. On known populations of edge angles of natural fractures and man-produced flaked stones, a demonstrated separation between the two classes could be observed.

Combining an examination of the primary context from which specimens were collected and applying the Barnes test, human origins have been supported for stone assemblages from such sites as Tochaco (Arizona), Los Encinos (New Mexico), the Manix Lake Industry and the Farmington complex (California). However, in all of these examples, the flaked specimens appear to represent quarry workshop materials, not typologically ancient implements. On the other hand, there are a number of flaked stone assemblages that must be rejected as evidence of human activity. These include, among others, Freisenhahn Cave (Texas), Medicine Hat (Alberta), Timlin (New York), and Texas Street and Calico (California).

When the two classes of evidence are combined, a clear pattern seems to emerge. Those assemblages that can be demonstrated on the basis of compelling evidence to be older than 12,000 radiocarbon years old are precisely those for which the evidence for human instrumentality is the most problematical. Many localities are simply not archaeological sites. On the other side, for sites with physical evidence undoubtedly associated with human activity, an antiquity greater than about 12,000 radiocarbon years cannot be clearly demonstrated. No reported pre-Clovis site can be singled out which contains strong temporal and artifactual evidence. At best, the examination of the evidence has narrowed the number of possible authentic pre-Clovis localities.

These include the Shriver site (Missouri), South Gulch (California), and Little Canyon Creek Cave (Wyoming). No conclusions concerning the status of these localities can be offered at the present time, but additional studies are clearly warranted. The reluctant conclusion that must be reached is that to date there has been nothing unearthed that unambiguously demonstrates the existence of a pre-Clovis occupation in North America.

References

- Payen, L.A. 1982 Artifacts or Geofacts at Calico: Application of the Barnes Test. In *Peopling of the New World*, J.E. Ericson, R.E. Taylor, & R. Berger, eds. Ballena Press: Anthropological Papers No. 23:193-201.
- 1982 The Pre-Clovis of North America: Temporal and Artifactual Evidence. Ph.D. dissertation, Univ. of Calif., Riverside.
- Payen, L.A. and R.E. Taylor 1976 Man and Pleistocene Fauna at Potter Creek Cave, California. *Journal of California Anthropology*, Vol. 3(1):51-58.
- Taylor, R.E. and L.A. Payen 1979 The Role of Archaeometry in American Archaeology: Approaches to the Evaluation of the Antiquity of *Homo sapiens* in California. In *Advances in Archaeological Method and Theory*, M. Schiffer, ed., Vol. 2:239-283. N.Y.: Academic Press.

SAS Research Reports is a Newsletter supplement designed to facilitate communication of current research and interim reports of data and analysis from long-term projects. Manuscripts should be submitted to the **Newsletter Editor** for consideration. Send 1 original and 1 copy. Reports must be limited to approximately 8 manuscript pages, double spaced, including tables and illustrations.

MEETING NOTES

UPCOMING MEETINGS

March 18-19, 1983. Sixth Annual Ethnobiology Conference. University of Oklahoma, Norman, OK. Sponsored by Department of Anthropology, Department of Botany & Microbiology, Stovall Museum, Oklahoma Archeological Survey. Contact: Dr. Paul Minnis, Department of Anthropology, University of Oklahoma, Norman, OK 73019.

April 18-22, 1983. International Archaeometry Symposium. Castel Dell'ovo, Naples, Italy. Organizer: R.E. Linington, Fondazione Lerici Prospezioni Archeologiche, Via V. Veneto 108, 00187 Rome, Italy (tel. 06/460083).

April 27-30, 1983. Society for American Archaeology Meetings. Pittsburgh (PA) Hilton Hotel. Symposium 40: Archaeological Uses of Plant Opal Phytolith Analysis: Current Research, scheduled at 8:00-11:00 a.m., Saturday, 30 April 1983. This will be followed by the SAS sponsored panel discussion on phytolith research.

May 27-30, 1983. American Association for the Advancement of Science Meetings. Detroit (MI) Renaissance Center, Westin Hotel. Symposium: Multidisciplinary Approaches to Plant Opal Phytolith Research, scheduled at 9:00-12:00 a.m. and 1:30-4:30 p.m., Tuesday, 31 May 1983.

RECENT PUBLICATIONS

REMOTE SENSING HANDBOOK

The Remote Sensing Division, National Park Service, has published three additions to its **Handbook** series, which describe practical methods and applications of remote sensing to cultural resources management:

No. 5 **Remote Sensing: Multispectral Analyses of Cultural Resources**

No. 6 **Remote Sensing: Archeological Applications of Remote Sensing in the North Central Lowlands**

No. 7 **Remote Sensing: Aerial and Terrestrial Photography for Archeologists.**

For information about these and other publications, please feel free to contact James I. Ebert, Acting Chief, at the Remote Sensing Division, P.O. Box 26176, Albuquerque, NM 87125.

Volumes include papers on shipwreck archaeology; methods and techniques; inundated aboriginal sites; underwater cultural resources management; panel discussions; illustrations, maps, photographs. Special 2 book offer, Nos. 1 & 2: \$25.00. Send orders to Fathom Eight, P.O. Box 8595, San Marino, CA 91108. Foreign orders please add appropriate postage.

READINGS IN GLASS HISTORY

Readings in Glass History No. 13/14 is devoted primarily to the Islamic and Crusader Periods, the central theme being Glass and Religious Man. The readings have been selected and edited by Anita Engle.

Chapters 1 and 2 present significant finds from the vicinity of the River Belus, a glass-making center in the Islamic Period. The finds are of particular interest, since the area was famous for its exports during the Islamic and Crusader Periods. Chapter 3 considers the Teutonic Knights in Crusader Palestine and their connection with the enigmatic beakers known as the "Syro-Frankish" group. In Chapter 4, 13th century sources on the use of glass vessels are recorded. Chapter 5 looks at the representation of the citron in Islamic glass, while Chapter 6 discusses enamelled beakers from a Jewish cemetery in Damascus. In Chapter 7 Professor K. Yamasaki suggests religion and cult were the incentives for the early glass production in Japan.

UNDERWATER ARCHAEOLOGY

In the Realms of Gold. The Proceedings of the Tenth Conference on Underwater Archaeology, Wilburn A. Cockrell, ed. Fathom Eight Special Publication #1, San Marino, CA. \$12.00.

Underwater Archaeology: The Challenge Before Us. The Proceedings of the Twelfth Conference on Underwater Archaeology, Gordon P. Watts, Jr., ed. Fathom Eight Special Publication #2, San Marino, CA. \$16.00.

108 pages, 200 illustrations, 3 maps. \$15.00.

Previous numbers of **Readings in Glass History**:

No. 1, Jan 1973: Origins and spread of the ancient glass industry. \$10.00

No. 2, July 1973: Islamic and Crusader periods. \$10.00

No. 3, Jan 1974: Cult and the craftsman. \$10.00

No. 4, July 1974: Glass vessels and glass-makers of Jewish origin. \$10.00

No. 5, April 1975: Glassmaking families of Lorraine and their antecessors. \$10.00

No. 6/7, July 1976: Glass and the Silk Route. \$15.00

No. 8, Jan 1977: Glass and the Elizabethan Period. \$10.00

No. 9, July 1977: Index volume to **Readings in Glass History**, Nos. 1-8. \$10.00

No. 10, July 1978: Ancient glass in its context. Illustrated companion to Nos. 1-8.

No. 11, July 1980: The Sidonian glass-makers and their market. \$12.50

No. 12, March 1981: The glassmakers of Altare. \$14.00

Orders are dispatched by registered book post on receipt of payment. There is a mailing

charge of \$1.00 per copy. Special offer: Nos. 1-10 for \$94.50 per set plus \$6.00 postage. Additional 10% discount for orders of the entire series. Phoenix Publications, Jerusalem, P.O. Box 8190, Jerusalem, Israel 91081.

FAUNAL REMAINS

B. Miles Gilbert has prepared a 252-page volume entitled **Avian Osteology**. It contains references to archaeological and zoological publications through mid-1980. It is an osteology of North American birds useful to game wardens, archaeologists and zoologists.

Contents:

- I. Avian osteo-archaeology
- II. Skeletal differences separating male-female and wild-domestic turkeys
- III. Osteology and keys to separating families by elements: furculum, carina, coracoid, scapula, humerus, radius, ulna, carpometacarpus, phalanx, synsacrum, femur, tibio-tarsus, tarso-metatarsus.

Order from: B. Miles Gilbert, 709 Kearney, Laramie, WY 82070. Cost is \$20.00 plus postage. Wyoming residents add 3% sales tax.

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