SAS
VOLUME 4 NUMBER 4 SPRING 1981
NEWSLETTER
SOCIETY FOR ARCHAEOLOGICAL SCIENCES

CURRENT RESEARCH

STRONTIUM/CALCIUM RATIOS IN PALEODIETARY RESEARCH

Determining the diets of prehistoric peoples is fundamentally important to physical anthropologists, archaeologists, and to others who seek information about the human biological and cultural past. Investigators of human prehistory have traditionally relied upon evidence of edible material, paleohabitat data, and skeletal evidence of malnutrition to provide this dietary information. However, these techniques are not without their shortcomings, which are derived not only from the scant archaeological record, but also from the assumptions on which any given technique is based. An outstanding problem is the determination of the proportion of meat vs. vegetable foods in paleodiets. In the last few years, a number of new techniques for analysis of skeletal material have been developed that may provide proportionate information previously unavailable to archaeologists and physical anthropologists. These techniques include the analysis of tooth microwear, carbon isotope composition of skeletons, and the analysis of skeletal strontium. The latter technique, the analysis of strontium/calcium ratios of faunal and human skeletal material, has been the subject of my research at the National Museum of Natural History, Smithsonian Institution.

The technique is based on the well-documented distribution of strontium in land-based food chains. In a given food-chain, plants at the base of the chain generally have the highest Sr/Ca ratios. This is because the Sr/Ca ratio of plants tends to reflect that of the alkaline earths available to them. Mammals, on the other hand, discriminate against strontium in favor of calcium in the intestinal absorption of these alkaline earths, and preferentially clear strontium from plasma as well. As a result, the bones of herbivores have lower Sr/Ca ratios than the plants these animals consume. Carnivores, ingesting flesh that has already discriminated, repeat the process. As a result, carnivores may be expected to have the lowest Sr/Ca ratios in a given food chain. This information forms the basis of the suggested technique for inferring the proportion of meat and vegetable foods in palodiets by reference to the Sr/Ca ratios of skeletons. Because vegetable foods contain higher Sr/Ca ratios than meat foods, diets heavily dependant on vegetable foods may be expected to result in relatively high Sr/Ca ratios in bone. Conversely, diets heavily dependent on meat foods may be expected to result in relatively low Sr/Ca ratios in bone.

While the biological basis of the technique may be sound, the quality of information obtained from bones that have been buried for many thousands of years is quite another matter, because of the alteration in chemical crystalline composition that may have occurred after they were interred. It was therefore necessary to test the technique at a site where a) similar herbivore and similar carnivore fauna were present in numbers from at least two different time periods, b) well-characterized human skeletons were also present from at least one of these levels, c) adequate stratigraphic controls were available for both the faunal and human bones, and d) other information about the diet of the site's inhabitants was available against which to compare the results of the technique. Human and faunal skeletal material from the Natufian and Aurignacian site of Hayonim Cave, in the Western Galilee was made available through the generosity of Dr. Ofer Bar-Yosef and Dr. Eiton Tchernov of Hebrew University, and Dr. Baruch Arensberg of the University of Tel Aviv Medical School.

In the Hayonim study, approximately 1 gram of diaphyseal cortical bone was broken from faunal and human long bones associated with identifiable epiphyses. In all, some 20-30 herbivores and 20-30 carnivores were selected from each of the two stratigraphic levels. In the laboratory, the bone fragments were carefully examined under a dissecting microscope, and discolored periortial mineral was discarded. From each specimen, 4-5 milligram samples were weighed with an ultramicro-balance, digested with hot concentrated nitric acid, and brought to dryness. The redissolved samples were analyzed for calcium with conventional flame atomic absorption spectrophotometry, and for strontium with an atomic absorption spectrophotometer fitted with a high temperature graphite furnace. The procedure was performed in duplicate for each specimen, and when a difference of greater than 15% in Sr/Ca ratio was found between duplicate digestions, additional duplicate digestions were performed. (For details, see Sillen, 1981 a and b.)

NEWS OF THE SOCIETY

ELECTION RESULTS

The results of the recent balloting for elected officers of the SAS was announced at the Third Annual Business meeting in San Diego by the Secretary-Treasurer, Matthew Hall. John Weymouth (Nebraska) was elected to the office of Vice President/President-elect and Elizabeth Coughlin (Harvard) was elected Assistant Secretary-Treasurer/Secretary-Treasurer Elect. These newly elected officers joined with others who assumed their responsibilities at that time: Jonathon Ericson (Harvard) President, R.E. Taylor (UCR) Past President, and David Weide (Nevada, Las Vegas) Secretary-Treasurer. Other members of the Executive Board for 1981-1982 include Suzanne de Atley (Smithsonian), Newsletter Editor, Curt Beck (Vassar) Consular, Foss Leach (University of Otogo, New Zealand) Consular, and Robert Maddin (Pennsylvania), Consular.

THIRD ANNUAL SAS MEETING: PRELIMINARY REPORT

The next SAS Newsletter will carry a more detailed report of the Annual Meeting. Some important statistics reported at the meeting, however, included the current membership figure of the SAS which now stands at 591. Eighty-one SAS members attended the San Diego meeting. The list of symposia that included archaeological science topics is listed in the next section.

PUBLICATION OF THE SAS MEMBERSHIP LIST

After discussion at the SAS Business Meeting, it was decided that the publication of the names and addresses of SAS members would be extremely helpful to the membership at large. At the same time, it was also agreed that any member who for any reason did not want his/her name and/or address published could have it omitted. Therefore any member who does not wish to have his/her name and/or address published in a forthcoming listing should contact the Office of the General Secretary as soon as possible.

MEETING NOTES

SAS/SAA MEETING, SAN DIEGO

The SAS held its third Annual Meeting in conjunction with the Society for American Archaeology in San Diego, April 30th to May 1st. This year the SAS program consisted of five symposia covering a variety of topics. These were:

- New Perspectives in Biogeochemistry Applied to Archaeology, organized by Jonathon E. Ericson (Harvard)
- Early Man in the New World, New Developments: 1970-1980, organized by Richard Shutler, Jr. (Simon Fraser University)
- Advances in Archaeological Geochronology, organized by R.E. Taylor (U.C. Riverside)
- Application of Materials Analysis in the Study of Ceramic Production, organized by Suzanne P. De Atley (Smithsonian) and Marilyn P. Beaudry (UCLA)
- Contributions in Archaeological Science, chaired by David Mc Junkin (UCLA).

The SAA program also included a number of sessions which emphasized the use of archaeological sciences:

- Oceanography and Prehistoric Archaeology, organized by David R. Watters (Woods Hole Oceanographic Institute)
- Behavioral Inferences from Objective Studies of Ceramics, organized by JoLee Pearson and Marion Smith (South Carolina)
- Archaeology of Gatecliff Shelter and Monitor Valley, organized by David Hurst Thomas (American Museum of Natural History)
- The Haw River Archaeological Project: Methodological Advances in Southeastern Prehistory and Geo-Archaeology, organized by Joseph Schuldenrein (Commonwealth)
- South American Paleoethnobotany: the Application of Techniques and Data to Questions of Cultural Process, organized by Christine A. Hastorf (UCLA) and Deborah M. Pearsall (Missouri)
- The Study of Seasonality in Archaeological Sites, organized by Gregory G. Monks (Manitobaz)
- Past Environment and Subsistence at Chaco Canyon New Mexico, organized by William B. Gillespie (Chaco Center)
- Mortuary Practices, General session chaired by Charles F. Merbs (Arizona State U.)
- Science in Archaeology: Techniques, General session chaired by A.E. Dittert, Jr. (Arizona State U.)
- Paleoecology, General session chaired by Victoria Dirst (Wisconsin-Oshkosh)

The study at Hayonim Cave indicated that excellent discrimination of diets on the basis of the technique is possible for the Natufian, but not for the Aurignacian. In turn, it is possible to conclude that while the technique can provide dietary information on Natufian humans and their descendents, careful faunal controls including both herbivores and carnivores need to be employed in any comparison of strata or sites.

The Hayonim Cave study provides the pilot data for a larger study of the dietary changes that may have occurred with the development of food production in the Near East. Recent theoretical models suggest that there may have been no major nutritional changes commensurate with the economic one. While incipient domesticators may have been well-nourished, this does not suggest that dietary changes may not have occurred within the spectrum of healthful diets in late Epi-Paleolithic and Neolithic times. For example, it has been suggested that late Epi-Paleolithic hunters and gatherers, (the Natufians), were increasingly exploiting wild cereals and legumes, and that domestication occurred largely as an effort to expand the range of these plants. Therefore, information both on the nutritional status and the proportionate amounts of plants in the diets of healthy Epi-Paleolithic hunters and gatherers would bear directly on the adequacy of recent explanations of the development of food production in the Near East. In the next year, Sr/Ca ratios of faunal and human skeletal material from the Levantine Natufian and Pre-Pottery Neolitic sites will be examined, in particular El Wad, Hayonim Cave and Terrace, Kebara, Jericho, Nahal Oren, Abu Gosh, and Ain Mallaha. The Sr/Ca ratios will be used to calculate the proportionate amount of meat and vegetable foods in the diets of these Natufian and Pre-Pottery Neolithic peoples. This information will be compared to conclusions about the diets of these peoples already drawn from tooth-wear analyses, site-catchment analyses, and analyses of the technological assemblages. In this manner, it is hoped to provide relevant information on an important period in human history, the development of food production, as well as on the appropriate interpretation of more conventional methods of paleodietary inference.

Submitted by Andrew Sillen, Department of Anthropology, NMNH, Smithsonian Institution

RESEARCH NOTES

John Gifford (Archaeometry Laboratory, University of Minnesota) and B.H. Van Andel (Geology Department, Standord University) have received a NGS research grant to core sample Holocene marine sediments in Koiladha Bay, Argolid, Greece, during August 1981. These sediments will be correlated with nearby Holocene terrestrial units already mapped, and with subbottom seismic profiles made in 1979 (Van Andel et al. Journal of Field Archaeology 7, 1980).

SAS NEWSLETTER **Volume 4** **Number 4** **Spring 1981**

Published quarterly by the Society for Archaeological Sciences. Distributed to the members of the Society with membership, $7.50 per year, $5.00 per year for students.

EDITOR: S.P. De Atley, Conservation Anaytical Laboratory, HTB AB070, Smithsonian Institution, Washington, D.C. 20560

SAS

ASSOCIATE EDITORS: David Mc Junkin, Christine Prior

For inquires concerning change in addresses, information from membership records, and other business affairs, contact: Office of the General Secretary, SAS, Radiocarbon Laboratory, Department of Anthropology, University of California, Riverside, CA 92521.

CONFERENCE ON PREHISTORIC CHERT EXPLOITATION

A conference on prehistoric chert exploitation was held by the Center for Archaeological Investigations in Carbondale, Illinois on May 22-23. While the papers concentrated on the Ohio and Cental Mississippi River region, the Upper Midwest, Southeast, and Eastern Plains were also represented. Topical interests included: 1) substantive reports on regional geology and nomenclature; 2) descriptive and interpretive reports on specific source/quarry areas; and 3) a range of method - and - technique oriented papers focusing on results and/or problems found in trace element analysis, macroscopic identification of chert types, and interregional nomenclature. Other topics included a discussion of future directions in interdisciplinary research and possibilities for developing a regional clearinghouse for exchange or chert type samples and results of research.

A volume of selected conference papers will be published by the Center for Archaeological Investigations, SIU-Carbondale, and should be available late this year or early 1982. Anyone wishing additional information should contact Ernest Mac or Brian Butler, Center for Archaeological Investigations, Southern Illinois University, Carbondale, Ill. 62901.

Submitted by David Ives, Archaeological Survey, University of Missouri at Columbia

UPCOMING MEETINGS

Sept. 8-11, 1981, Remote Sensing Symposium, Winnipeg, Manitoba. Canadian Remote Sensing Society. Donald Pearson, Box 1106 Winnipeg R3C2X4

Sept. 14-19, 1981, 1st International Symposium on Archaeo-Metallurgy on Site, EILAT, Israel. Covers Timna Valley and other important ancient sites of copper mining and smelting. Convened by IAMS (Institute for Archaeo-Metallurgial Studies, Institute of Archaeology,University of London) in cooperation with the Israel Institute of Metal, Technion-Israel Institute of Technology, Haifa and Institute of Mining Metals, Museum Ha'aretz. Main topics of the symposium: Mining; Extractive Processes and Installations; Metal Technology; Provenance; Native Copper; Conservation of Metal Artifacts; Archaeometry in Archaeo-Metallurgy; Methods of Archaeo-metallurgial Exploration and Sampling; Mining and the Metallurgy of Timna, the Arabah and Sinai. Address: Secretariat, 1st International Symposium on Archaeo-Metallurgy on Site, P.O. Box 29784, Tel-Aviv, Israel.

SAS **SOCIETY FOR ARCHAEOLOGICAL SCIENCES**
Radiocarbon Laboratory, Department of Anthropology
University of California, Riverside, California 92521