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NEWSLETTER
SOCIETY FOR ARCHAEOLOGICAL SCIENCES

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CURRENT RESEARCH

Thermoluminescence Dating of Ancient Heated Rocks: A Progress Report and Sample Request

A major thrust of the thermoluminescence (TL) laboratory at Washington University in St. Louis, Missouri, is the development of absolute TL dating techniques for ancient heated rocks. There are two primary purposes in undertaking this work. First, heated rocks are common artifacts in ancient archaeological sites and the ability to date them would represent a useful advance in the chronological reconstruction of the habitations of early man. Second, a comparison of these ages with ^{14}C measurements would determine fluctuations of ^{14}C production in the past. This information is necessary to verify and extend the tree ring "calibrated" ^{14}C time scale and is also of great inherent geophysical interest.

In this program of dating ancient heated rocks, the TL measurements are restricted to quartz which has been shown to be the most reliable mineral for dating purposes. Basically, the TL from the quartz is used as a measure of the total radiation dose received by the rock since it was heated by ancient man. The age is obtained by dividing this dose by the dose rate which is calculated from radioactivity measurements on the sample and associated burial materials.

The most common quartz-bearing rocks are sandstone, quartzite, and granite. Sandstone and quartzite usually contain little radioactivity and the dose rate to the quartz is largely external. For a granite, the dose rate is dominated by beta radiation from the high concentration of radioactivity in the rock itself. Although both of these kinds of rocks can be dated, granites are expected to give more accurate dates because uncertainties associated with variations in the external radiation dose rate are minimized. The best situation is when both low and high radioactivity rocks are present in the same fired structure, in which case the former can be used to measure the external dose to the latter.

Recent efforts have concentrated on the radiation dosimetry of granites. The basic problem is to determine the beta-ray dose rate received by quartz grains in a granite from the heterogeneously-distributed radioactivity. This problem has been solved by using a computer to scan a three-dimensional matrix representation of the rock where the value of each matrix element represents the mineral type found at that point in the rock. The matrix is generated manually from cathodoluminescence photographs taken as a function of depth. The computer program scans the matrix and calculates the average percentage of each mineral as a function of distance from the quartz points. The dose rate is then calculated by folding in the

radioactivity concentrations of each mineral type and the latest beta-ray dosimetry data.

First samples of heated rocks were obtained from the palaeolithic site of Pincevent, France, through the courtesy of Prof. Leroi-Gourhan. A preliminary age of 10,000 years B.C. has been obtained using granite and sandstone from the same fireplace. The TL age is in reasonable agreement with the uncalibrated radiocarbon ages which range from 8,000 to 10,000 years B.C.

These initial results are very encouraging and attempts are now being made to locate and collect additional samples. Collection efforts are being continued in France by Dr. G. Poupeau, a co-investigator on this project and employee of the French CNRS at the Centre des Faibles Radioactivities, Gif-sur-Yvette. In addition, it is hoped that samples from New World sites may be obtained. Specifically, samples in the time periods 500 to 2,000 and 5,000 to 8,000 years old are required to check the accuracy of the TL method and to compare the results with the bristlecone calibration curve. As mentioned above, the best rocks for the measurements are granites, sandstones and quartzites, but other quartz-bearing rocks may also be suitable. Also required is well-associated carbon-bearing material for radiocarbon analysis.

Anyone who has samples which may be suitable for this study in invited to contact Professor Robert Walker or Stephen Sutton, Washington University, Department of Physics, St. Louis, Missouri 63130; telephone: (314) 889-6225.

RESEARCH NOTES

Obsidian Trace Element Studies

The National Science Foundation has approved a grant to the University of Missouri Research Reactor Facility in Columbia, Missouri for "A Definitive Trace Element Analysis Program for Mesoamerican Obsidians". The study will emphasize: 1) improving the definition of, and differentiation among, the major known Mesoamerican obsidian sources; 2) increasing the confidence with which Mesoamerican obsidian artifacts can be associated with specific quarries or source areas and; 3) providing accurate concentrations for over 30 chemical elements for both the intra-and inter-source characterization of Mesoamerican obsidian. Drs. Robert H. Cobean and James R. Vogt are co-principal investigators for this project, which will be conducted at the Nuclear Archaeology Laboratory in the Research Reactor Facility.

Submitted by David J. Ives, SAS Upper Mid-west Coordinator, University of Missouri-Columbia.

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Meeting Notes

TENTH INTERNATIONAL RADIOCARBON CONFERENCE

The Tenth International Radiocarbon Conference was held August 19-26, 1979 in Bern, Switzerland and Heidelberg, Germany and sponsored jointly by the Physikalisches Institut, Universitat, Bern and the Institut fur Umweltphysik, Universitat, Heidelberg. The conference was well-attended by members of the profession from all over Europe, North America, Scandinavia, Brazil, Argentina, India, Egypt and parts of Africa and the USSR.
The meetings in Bern were opened by an invited lecture from G. Castagnoli and D. Lal on the *Solar modulation effects in terrestrial production of carbon -14* and in Heidelberg by W.S. Broecher on the *Natural carbon cycle and its perturbation by man.* The presented and poster session papers covered such topics as the natural variations in C-14, man-made C-14 variations, the development of the technique itself as well as its application in dating various materials such as wood, shell, bone, ceramics and volcanic emanations. Other topics included the use of the technique in archaeology, oceanography, quaternary, soil and hydrological studies. Also discussed was the considerable progress being made in the use of accelerator techniques in radiocarbon dating.

Drs. Hans Oeschger and Karl Otto Muennich are to be commended on their fine organization. Not only were the members exposed to a unique intellectual experience but were also exposed to two fine cities and their cultural heritages.

Reported by P.I. van der Hoeven

THE FORMATION OF AN INTERNATIONAL CALIBRATION COMMITTEE

An *International Calibration Committee* was established during the meetings of the *Tenth International Radiocarbon Conference* in Bern and Heidelberg this August. Its objectives are a) to collect available data on precisely dated known age material, b) to combine European and American data, c) to devise an internationally acceptable calibration and d) to create a mechanism for collecting data and to relatively update the calibration. Tentative committee members include: as chairpersons G. Pearson (Northern Ireland) and P. Damon (USA), H. Oeschger, M. Clark, A. Nefetl, M. Struiver, H. Suess and others. The first meeting was held in Heidelberg during the second portion of the conference.

The announcement of the formation of this committee was received enthusiastically as an important and necessary step in the advancement and application of radiocarbon dating research.

Reported by P.I. van der Hoeven

Recent Publications

PHOTOMICROGRAPHIC AID TO THE IDENTIFICATION OF WOOD

A collection of photomicrographs of the microstructure of over 450 of the world's wood has been assembled by the Princes Risborough Laboratory, Building Research Establishment, Department of the Environment in England. These photomicrographs are available in book form under the title *Photomicrographs of World Woods* and is available from "Her Majesty's Stationary Office" at a cost of about $40 U.S. plus postage.

Each wood sample is illustrated by photomicrographs of the structure as seen under the microscope in three planes: transverse, tangential and radial to the plane of growth. The range of magnifications used is limited to enable comparison of structurual features between different types of wood. For further information contact Thomas Harding, Princes Risborough Laboratory, Building Research Establishment, Department of the Environment, London, England, Original publication: *Science and Archaeology,* No. 21, pp. 36-37 (1979).

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