

**INTERNATIONAL WORKSHOP
ON INTER-COMPARISON OF
RADIOCARBON LABORATORIES**

GLASGOW, 12–15 SEPTEMBER 1989

A workshop was held in Glasgow in September, 1989 on the topic of the Inter-Comparison of Radiocarbon Laboratories. The meeting was hosted by the University of Glasgow, Scottish Universities Research and Reactor Centre and the NERC ^{14}C laboratory at East Kilbride. The scientific program of the workshop covered previous and current inter-comparison studies of radiocarbon laboratories, as well as future developments in this field.

The Proceedings will be published by *RADIOCARBON* as a Special Issue in Volume 32, No. 3, 1990.

For more information please contact:

RADIOCARBON
4717 East Ft Lowell Road
Department of Geosciences
The University of Arizona
Tucson, AZ 85712
Tel: (602) 881-0857
Fax: (602) 621-2672
E-mail: C14@ARIZRVAX

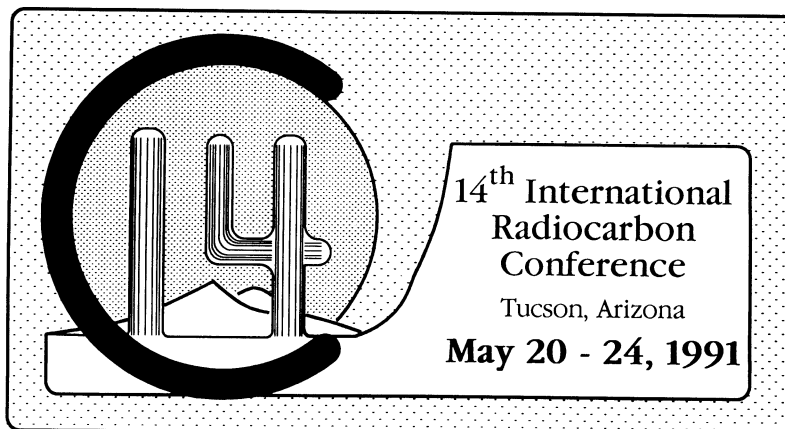
Radiocarbon

**Proceedings of the 13th
International Radiocarbon Conference
Dubrovnik, Yugoslavia
20–25 June 1988**

Radiocarbon, Volume 31, Number 3, 1989 @ \$60.00

Please order from: Radiocarbon
4717 East Ft Lowell Road
Department of Geosciences
The University of Arizona
Tucson, Arizona 85712

Announcing. . .



An international meeting on research in Radiocarbon Dating, Accelerator Mass Spectrometry and Related Fields.

Second circular will be sent May 1990.

Contact: Dr. Austin Long
Department of Geosciences
University of Arizona
Tucson, AZ 85721 USA

FAX: 602-621-2672

Telex: 650-3839821

BITNET: C14@ARIZRVAX

SEND FOR A FREE SAMPLE COPY

QUATERNARY SCIENCE REVIEWS

The International Review and Research Journal

Editor-in-Chief: **DAVID Q BOWEN**, *Institute of Earth Studies, UCW, University of Wales, Penglais Campus, Aberystwyth SY23 3DB, UK*

Quaternary Science Reviews caters for all aspects of Quaternary science, and includes, for example, geology, geomorphology, geography, archaeology, soil science, palaeobotany, palaeontology, palaeoclimatology and the full range of applicable dating methods. The dividing line between what constitutes the review paper and one which contains new original data is not easy to establish, so *QSR* also publishes papers with new data especially if these perform a review function, or can be so adapted for a wider perspective, for example, as in methods of dating.

All the Quaternary sciences are changing rapidly and subject to re-evaluation as the pace of discovery quickens; thus the eclectic and comprehensive role of *Quaternary Science Reviews* keeps readers abreast of the wider issues relating to new developments in the field.

A Selection of Papers

V MARKGRAF (USA), Palaeoclimates in Central and South America since 18,000 BP based on pollen and lake-level records.

K-E BEHRE (FRG), Biostratigraphy of the last glacial period in Europe.

A-M LÉZINE (France) & **J CASANOVA** (Canada), Pollen and hydrological evidence for the interpretation of past climates in tropical West Africa during the Holocene.

N EYLES, C H EYLES (Canada) & **A M McCABE** (UK), Sedimentation in an ice-contact subaqueous setting: the mid-Pleistocene 'North Sea Drifts' of Norfolk, UK.

J P BRADBURY (USA), Late Quaternary lacustrine paleoenvironments in the Cuenca de México.

Indexed/Abstracted in: *Curr Cont ASCA, Chem Abstr Serv, Geo Abst, Geo Bib & Indx, INSPEC Data, Curr Cont Sci Cit Ind, Curr Cont SCISEARCH Data*

Subscription Information

1990: Volume 9 (4 issues)

Annual subscription (1990)

DM 355.00

Two-year rate (1990/91)

DM 674.50

ISSN: 0277-3791

(00636)



PERGAMON PRESS plc

Member of Maxwell Macmillan Pergamon Publishing Corporation

Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, UK

Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford NY 10523, USA

Advertising rate card available on request. Back issues and current subscriptions are also available in microform. The DM prices shown include postage and insurance. For subscription rates in the Americas, Japan, UK and Eire please contact your nearest Pergamon office. Prices and proposed publication dates are subject to change without prior notice.

SEND FOR A FREE SAMPLE COPY

QUATERNARY INTERNATIONAL

The Journal of the International Union for Quaternary Research

Editor-in-Chief: **NAT RUTTER**, *Department of Geology, University of Alberta, Edmonton, Alberta T6G 2E3, Canada*

Associate Editor: **NORM R CATTO**, *Department of Geography, Memorial University of Newfoundland, St. John's, Newfoundland A1B 3X9, Canada*

Quaternary International is the official journal of the International Union for Quaternary Research. The objectives are to publish a high quality scientific journal under the auspices of the premier Quaternary association that reflects the interdisciplinary nature of INQUA and records recent advances in Quaternary Science that appeal to a wide audience. This series will encompass all the full spectrum of the physical and natural sciences that are commonly employed in solving Quaternary problems. The policy is to publish peer refereed collected research papers from symposia, workshops and meetings sponsored by INQUA's Commission, Sub-Commission and working groups. In addition, other organizations may request publication of their collected works pertaining to the Quaternary. Guest Editors will be appointed for each volume.

Forthcoming series will include collected papers on applied Quaternary geochronology, global change and the last interglacial in Europe.

A Selection of Papers

H P SCHWARCZ (Canada), Uranium series dating of Quaternary deposits.

R C WALTER (USA), Application and limitation of fission-track geochronology to Quaternary tephrae.

S L FORMAN (USA), Applications and limitations of thermoluminescence to date Quaternary sediments.

L ZÖLLER & G A WAGNER (FRG), Thermoluminescence dating applied to paleosols.

R GRÜN (UK), Electron spin resonance (ESR) dating.

R LOVLIE (Norway), Paleomagnetic stratigraphy: a correlation method.

E JANSEN (Norway), The use of stable oxygen and carbon isotope stratigraphy as a dating tool.

A BERGER (Belgium), Pleistocene climatic variability at astronomical frequencies.

L STARKEL (Poland), Global paleohydrology.

Subscription Information

1990: Volumes 5-8

Annual subscription (1990)

DM 190.00

Two-year rate (1990/91)

DM 361.00

ISSN: 1040-6182

(00865)



PERGAMON PRESS plc

Member of Maxwell Macmillan Pergamon Publishing Corporation

Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, UK

Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford NY 10523, USA

Advertising rate card available on request. Back issues and current subscriptions are also available in microform.

The DM prices shown include postage and insurance. For subscription rates in the Americas, Japan, UK and Eire please contact your nearest Pergamon office. Prices and proposed publication dates are subject to change without prior notice.

ARCHAEOLOGY

The prime research journal for the archaeologist interested in the involvement of the physical sciences in archaeology and art history. Articles are written with the non-specialist in mind while Research Notes provide state-of-the-art specialist reports.

Contents of Vol 32, part 1 (February 1990)

Cult objects and Edomite vessels from the Horvat Qitmit shrine (*J Gunneweg & H Mommsen*), Optical dating of sediments (*B W Smith et al*), Analysis of the Lycurgus Cup using analytical transmission electron microscopy (*J B Lambert et al*), Neutron radiography in archaeology (*B Tugrul*), Age at death determination using D-aspartic acid (*R D Gillard et al*), Vindobala, Hadrian's Wall: a shear-wave seismic refraction survey (*N R Goulty et al*), Thermal archaeological surveying (*M Noel & T J Bellerby*), The Thera eruption: the Third Congress (*S W Manning*), Radiocarbon AMS dates from Oxford (*R E M Hedges et al*)

Price, including postage, of the 1990 volume: Europe £21 sterling; elsewhere US \$53. Reduced prices for individuals: Europe £15 sterling; elsewhere US \$37. To order: send cheque or credit card details (VISA, ACCESS, MASTER, EURO, AMEX) to the address below. Despatch is by airfreight/surface to Europe, North America and Australia; by surface elsewhere (air rates on application). All back numbers are in stock. A limited number of FREE SPECIMEN ISSUES are available: write quoting RC.

Published twice a year by the Research Laboratory for Archaeology & the History of Art, Oxford University, 6 Keble Road, Oxford OX1 3QJ, UK. FAX no. 0865 273932.

Editors: M S Tite, M J Aitken, E T Hall,
R Hedges, J Henderson



PRICE LIST

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 ea)	\$60.00
Proceedings of the 11th International Radiocarbon Conference (Vol 25, No. 2, 1983)	\$50.00
Proceedings of the 10th International Conference (Vol 22, Nos. 2 & 3, 1980)	\$60.00
Vol 32, Nos. 1–3, 1990 (includes Glasgow Proceedings)	\$94.50/vol Inst \$63.00/vol Ind
Vol 31, Nos. 1–3, 1989 (includes Proceedings)	\$90.00/vol Inst \$60.00/vol Ind
Vol 30, Nos. 1–3, 1988	\$85.00/vol Inst \$55.00/vol Ind
Vol 29, Nos. 1–3, 1987	\$75.00/vol Inst \$50.00/vol Ind
Vol 28, Nos. 1, 2A & 2B, 3, 1986 (includes Proceedings)	\$80.00/vol Inst \$60.00/vol Ind
Vol 27, Nos. 1, 2A & 2B, 3, 1985	\$75.00/vol Inst \$50.00/vol Ind
Vol 26, Nos. 1–3, 1984	\$75.00/vol Inst \$50.00/vol Ind
Vol 25, Nos. 1–3, 1983 (includes Proceedings)	\$75.00/vol Inst \$50.00/vol Ind
Vol 24, Nos. 1–3, 1982	\$60.00/vol Inst \$40.00/vol Ind
Vol 23, Nos. 1–3, 1981	\$60.00/vol Inst \$40.00/vol Ind
Vol 22, Nos. 1–4, 1980 (includes Proceedings)	\$80.00/vol Inst \$60.00/vol Ind
Vols 11–21, 1969–1979	\$60.00/vol Inst \$40.00/vol Ind
Vols 1–9, 1959–1967	\$20.00/vol
Comprehensive Index (1950–1965)	\$20.00
Single issue	\$25.00
Out of Print:	
Vol 10, Nos. 1 & 2, 1968	
Vol 11, No. 2, 1969	
Vol 12, No. 2, 1970	
Vol 13, No. 1, 1971	
Vol 14, No. 1, 1972	
Special Package Offer:	
Full set, Vols 1–30 (1959–1988) + <i>free</i> subscription for 1990!	\$500.00
Postage & handling	
USA	25.00
Foreign	35.00

Foreign postage & 5% state sales tax on current volumes \$10.00/vol
Current domestic subscriptions will be charged sales tax
Postage & handling will be added to back orders

NOTICE TO READERS AND CONTRIBUTORS

Since its inception, the basic purpose of *RADIOCARBON* has been the publication of compilations of ^{14}C dates produced by various laboratories. These lists are extremely useful for the dissemination of basic ^{14}C information.

In recent years, *RADIOCARBON* has also been publishing technical and interpretative articles on all aspects of ^{14}C . We would like to encourage this type of publication on a regular basis. In addition, we will be publishing compilations of published and unpublished dates along with interpretative text for these dates on a regional basis. Authors who would like to compose such an article for his/her area of interest should contact the Managing Editor for information.

Other sections recently added to our regular issues include NOTES AND COMMENTS, LETTERS TO THE EDITOR and ANNOUNCEMENTS. Authors are invited to extend discussions or raise pertinent questions to the results of scientific investigations that have appeared on our pages. These sections include short, technical notes to relay information concerning innovative sample preparation procedures. Laboratories may also seek assistance in technical aspects of radiocarbon dating. Book reviews are also encouraged as are advertisements.

Manuscripts. Papers may now be submitted on both floppy diskettes and hard copy. When submitting a manuscript on a diskette, always include two hard copies, double-spaced, or wait until the final copy is prepared, after review, before sending the edited diskette. We will accept, in order of preference, WordPerfect, 5.1 or 5.0, Microsoft Word, WordStar or any major Macintosh or IBM word-processing software program. ASCII files, MS DOS and CPM formatted diskettes are also acceptable. The diskettes should be either $3\frac{1}{2}$ " (720K or 1.44 megabytes) or $5\frac{1}{4}$ " (360K or 1.2 megabytes). Radiocarbon papers should follow the recommendations in *RADIOCARBON* Style Guide (R, 1984, v 26, no. 1, p 152–158). Our deadline schedule for submitting manuscripts is:

<i>For</i>	<i>Date</i>
Vol 33, No. 1, 1991	Sept 1, 1990
Vol 33, No. 2, 1991	Jan 1, 1991

Half life of ^{14}C . In accordance with the decision of the Fifth Radiocarbon Dating Conference, Cambridge, 1962, all dates published in this volume (as in previous volumes) are based on the Libby value, 5568 yr, for the half-life. This decision was reaffirmed at the 11th International Radiocarbon Conference in Seattle, Washington, 1982. Because of various uncertainties, when ^{14}C measurements are expressed as dates in years BP the accuracy of the dates is limited, and refinements that take some but not all uncertainties into account may be misleading. The mean of three recent determinations of the half life, 5730 ± 40 yr, (Nature, 1962, v 195, no. 4845, p 984), is regarded as the best value presently available. Published dates in years BP can be converted to this basis by multiplying them by 1.03.

AD/BC Dates. In accordance with the decision of the Ninth International Radiocarbon Conference, Los Angeles and San Diego, 1976, the designation of AD/BC, obtained by subtracting AD 1950 from conventional BP determinations is discontinued in Radiocarbon. Authors or submitters may include calendar estimates as a comment, and report these estimates as cal AD/BC, citing the specific calibration curve used to obtain the estimate. Calibrated dates will now be reported as "cal BP" or "cal AD/BC" according to the consensus of the Twelfth International Radiocarbon Conference, Trondheim, Norway, 1985.

Meaning of $\delta^{14}\text{C}$. In Volume 3, 1961, we endorsed the notation Δ (Lamont VIII, 1961) for geochemical measurements of ^{14}C activity, corrected for isotopic fractionation in samples and in the NBS oxalic-acid standard. The value of $\delta^{14}\text{C}$ that entered the calculation of Δ was defined by reference to Lamont VI, 1959, and was corrected for age. This fact has been lost sight of, by editors as well as by authors, and recent papers have used $\delta^{14}\text{C}$ as the observed deviation from the standard. At the New Zealand Radiocarbon Dating Conference it was recommended to use $\delta^{14}\text{C}$ only for age-corrected samples. Without an age correction, the value should then be reported as percent of modern relative to 0.95 NBS oxalic acid (Proceedings 8th Conference on Radiocarbon Dating, Wellington, New Zealand, 1972). The Ninth International Radiocarbon Conference, Los Angeles and San Diego, 1976, recommended that the reference standard, 0.95 times NBS oxalic acid activity, be normalized to $\delta^{13}\text{C} = -19\text{‰}$.

In several fields, however, age corrections are not possible. $\delta^{14}\text{C}$ and Δ , uncorrected for age, have been used extensively in oceanography, and are an integral part of models and theories. For the present, therefore, we continue the editorial policy of using Δ notations for samples not corrected for age.

CONTENTS

FROM THE EDITOR

- Summary of The International Workshop on Intercomparison of ^{14}C
Laboratories
Austin Long iii

OBITUARY

- Serge Alexander Korff
CJ Heusser iv

ARTICLES

- Superconducting Mini-Cyclotrons as AMS Instruments
*KM Subotic, LŠ Milinkovic, MT Zupancic, DN Novkovic and
MS Stojanovic* 1
- Formation of $^{13}\text{C}/^{12}\text{C}$ Isotope Ratios in Speleothems: A Semi-Dynamic
Model
Marek Dulinski and Kazimierz Rozanski 7
- Further Investigations on ^{14}C Dating of Calcareous Tufa
Anna Pazdur and Mieczyslaw F Pazdur 17
- Survey of the Dispersion of ^{14}C in the Vicinity of the UK Reprocessing Site
at Sellafield
RL Otlet, AJ Walker and MJ Fulker 23
- Operation of the Harwell UK ^{14}C Data Base and its Expansion Through
Data Exchange With Other Laboratories
AJ Walker, RL Otlet, RA Housley and Johannes van der Plicht 31
- The Use of Radiocarbon Measurements in Atmospheric Studies
*MR Manning, DC Lowe, WH Melhuish, RJ Sparks, G Wallace,
CAM Brenninkmeijer and RC McGill* 37
- Re-Evaluation of British Museum Radiocarbon Dates Issued Between 1980
and 1984
SGE Bowman, JC Ambers and MN Leese 59
- Memory Effects in an AMS System: Catastrophe and Recovery
JS Vogel, JR Southon and DE Nelson 81
- Discussion: Recovery from Tracer Contamination in AMS Sample
Preparation
AJT Jull, DJ Donahue and LJ Toolin 84
- Discussion
David Elmore 86
- Dating the Turin Shroud—An Assessment
HE Gove 87
- Some Radiocarbon Dates for Tufas of the Craven District of Yorkshire, UK
Allan Pentecost, PM Thorpe, DD Harkness and TC Lord 93
- DATE LIST 99
- NOTES AND COMMENTS 107
- ANNOUNCEMENTS 119