Not whatter set and we we will to 1993 only
VOLUME 35/NUMBER 2/1993 only

Radiocarbon

An International Journal of Cosmogenic Isotope Research



Editor AUSTIN LONG

Managing Editor RENEE S. KRA

Assistant Editors
JAMES M. DEVINE
R. TRUED

QC 798 D3 A48 SCI-CPMR

> Department of Geosciences The University of Arizona 4717 East Ft. Lowell Road Tucson, Arizona 85712 USA



ISSN: 0033-8222

RADIOCARBON

An International Journal of Cosmogenic Isotope Research

Editor: AUSTIN LONG

Managing Editor: Renee S. Kra

Assistant Editors: JAMES M. DEVINE, JONETTA R. TRUED

Published by

Department of Geosciences

The University of Arizona

Published three times a year at The University of Arizona, Tucson, AZ 85712 USA. © 1993 by the Department of Geosciences, The University of Arizona.

Subscription rate: \$105.00 (for institutions), \$73.50 (for individuals), \$36.75 (for students with proper identification). Foreign postage is extra. A complete price list, including Proceedings of International Conferences, appears in the back of this issue.

Back issues and price lists may be obtained from the office of RADIOCARBON.

All correspondence and manuscripts should be addressed to the Managing Editor, RADIOCARBON, Department of Geosciences, The University of Arizona, 4717 East Ft. Lowell Road, Tucson, AZ 85712 USA. Tel: (602) 881-0857; Fax: (602) 881-0554. Please note our BITNET address: C14@ARIZVMS and INTERNET address: rkra@spider.aml.arizona.edu.

Offprints. The minimum offprint order for each article will be 100 copies without covers. No offprints will be furnished free of charge unless page charges are paid. The cost of additional copies will, of course, be greater if the article is accompanied by plates involving unusual expense. Copies will be furnished with a printed cover giving the title, author, volume, page and year, when specially ordered.

Page charges. Each institution sponsoring research reported in a technical paper or a date list, will be asked to pay a charge of \$80.00 per printed page. Institutions or authors paying such charges will be entitled to 100 free offprints without covers. No charges will be made if the author indicates that the author's institution is unable to pay, and payment of page charges for an article will, in no case, be a condition for its acceptance.

Missing issues will be replaced without charge only if claim is made within three months (six months for India, New Zealand and Australia) after the publication date. Claims for missing issues will not be honored if non-delivery results from failure by the subscriber to notify the Journal of an address change.

Illustrations should include explanation of symbols used. Copy that cannot be reproduced cannot be accepted. Whenever possible, reduce figures for direct publication. Line drawings should be in black India ink on white drawing board, tracing cloth, or coordinate paper printed in blue and should be accompanied by clear ozalids or reduced photographs for use by the reviewers. Photographs should be positive prints. Figures (photographs and line drawings) should be numbered consecutively through each article, using Arabic numerals. All measurements should be given in SI (metric units). Tables may be accepted as camera-ready copy.

Citations. A number of radiocarbon dates appear in publications without laboratory citation or reference to published date lists. We ask that laboratories remind submitters and users of radiocarbon dates to include proper citation (laboratory number and date-list citation) in all publications in which radiocarbon dates appear.

Radiocarbon Measurements: Comprehensive Index, 1950-1965. This index covers all published ¹⁴C measurements through Volume 7 of RADIOCARBON, and incorporates revisions made by all laboratories. It is available at \$25.00 per copy.

List of laboratories. Our comprehensive list of laboratories is available upon request. We are expanding the list to include additional laboratories and scientific agencies with whom we have established contacts. The editors welcome information on these or other scientific organizations. We ask all laboratory directors to provide their current telephone, telex, fax numbers and E-mail addresses. Changes in names or addresses, additions or deletions should be reported to the Managing Editor.

CONTENTS

FROM THE EDITOR - Journal Cost Crisis	
Austin Long	iii
OBITUARY - Elizabeth K. Ralph Henry N. Michael	V
ARTICLES	
Intra-Annual Variability of the Radiocarbon Content of Corals from the Galapagos Islands T. A. Brown, G. W. Farwell, P. M. Grootes, F. H. Schmidt and M. Stuiver	245
Radiocarbon Age of Lacustrine Deposits in Volcanic Sequences of the Lomas Coloradas Area, Socorro Island, Mexico J. D. Farmer, M. C. Farmer and R. Berger	253
Late Pleistocene-Recent Atmospheric δ^{13} C Record in C ₄ Grasses L. J. Toolin and C. J. Eastoe	263
Carbon Isotopic Composition of Deep Carbon Gases in an Ombrogenous Peatland,	
Northwestern Ontario, Canada R. Aravena, B. G. Warner, D. J. Charman, L. R. Belyea, S. P. Mathur and H. Dinel	271
Isotopic Analysis of Groundwater and Carbonate System in the Surdulica Geothermal Aquifer M. Hadžišehović, N. Miljević, V. Šipka, D. Golobočanin and R. Popović	277
Radiocarbon Dating of Paleoseismocity Along an Earthquake in Southern Italy G. Calderoni and V. Petrone	287
A Batch Preparation Method of Graphite Targets With Low Background for AMS ¹⁴ C Measurements H. Kitagawa, T. Masazawa, T. Nakamura and E. Matsumoto	. 295
AMS-Graphite Target Production Methods at the Woods Hole Oceanographic Institution During 1986-1991 A. R. Gagnon and G. A. Jones	
Radiocarbon to Calendar Date Conversion: Calendrical Bandwidths as a Function of Radiocarbon Precision	211
F. G. McCormac and M. G. L. Baillie	311
A Simplified Approach to Calibrating 14C Dates A. S. Talma and J. C. Vogel	. 317
Radiocarbon Dates from American Samoa J. T. Clark	. 323
NOTES AND COMMENTS	
¹⁴ C Dating of Laser-Oxidized Organics A. L. Watchman, R. A. Lessard, A. J. T. Jull, L. J. Toolin and W. Blake, Jr	. 331
An Assessment of the Radiocarbon Dating of the Dead Sea Scrolls G. A. Rodley	. 335
BOOK REVIEWS	. 339
RADIOCARBON UPDATES	. 343
LETTED TO THE EDITOR	. 345

ASSOCIATE EDITORS

For Accelerator Physics

DAVID ELMORE ROBERT E. M. HEDGES D. ERLE NELSON

West Lafayette, Indiana, USA Oxford, England Burnaby, British Columbia, Canada

For Archaeology

ANDREW M. T. MOORE MICHAEL B. SCHIFFER

New Haven, Connecticut, USA Tucson, Arizona, USA

For Atmospheric Sciences

GEORGE A. DAWSON

KUNIHIKO KIGOSHI DAVID C. LOWE Auckland, New Zealand Tucson, Arizona, USA Tokyo, Japan Lower Hutt, New Zealand

For Geochemistry

PAVEL POVINEC MINZE STUIVER

Bratislava, Slovakia Seattle, Washington, USA

For Geophysics

G. E. KOCHAROV WILLEM G. MOOK

St. Petersburg, Russia Groningen, The Netherlands

For Hydrology

JEAN-CHARLES FONTES

Orsay, France

For Ice Studies

HAROLD W. BORNS, JR. ULRICH SIEGENTHALER

Orono, Maine, USA Berne, Switzerland

For Oceanography

EDOUARD BARD

Gif-sur-Yvette, France Palisades, New York, USA Marseille, France

ELLEN R. M. DRUFFEL

Woods Hole, Massachusetts, USA

For Paleobotany

CALVIN J. HEUSSER

Tuxedo, New York, USA