



versity

en, Connecticut 06511

ISSN: 0033-8222

RADIOCARBON

YY

A'A.

18 1

10

4 ...

1.11

100

e • •

14

* 1

R.

AL

¥-18-

10 A

Editor: MINZE STUIVER

Managing Editor: RENEE S KRA

Published by

THE AMERICAN JOURNAL OF SCIENCE

Editors: JOHN RODGERS, JOHN H OSTROM, ROBERT A BERNER Managing Editor: MARIE C CASEY

Published three times a year, in Winter, Spring, and Summer, at Yale University, New Haven, Connecticut 06511.

Subscription rate \$75.00 (for institutions), \$50.00 (for individuals), available only in whole volumes. The price of the full volume 22, nos. 1-4, is \$60.00 for individuals and \$80.00 for institutions. The Proceedings of the Tenth International Radiocarbon Conference, vol 22, nos. 2 and 3, are available for \$60.00. The Proceedings of the Eleventh International Radiocarbon Conference is \$50.00.

All correspondence and manuscripts should be addressed to the Managing Editor, RADIOCARBON, Kline Geology Laboratory, Yale University, 210 Whitney Ave, PO Box 6666, New Haven, Connecticut 06511.

Reprints. The minimum reprint order for each article will be 50 copies without cover. No reprints 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, due when galley proof is returned. Institutions or authors paying such charges will be entitled to 100 free reprints without covers. No charge will be made if the author indicates that his institution is unable to pay them, and payment of page charges on an article will not in any case be a condition for its acceptance.

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

Missing issues will be replaced without charge only if claim is made within three months (six months for India and Australia) after the publication date. Claim for missing issues will not be honored if absence 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; it should be capable of reduction to not more than 10 by 17.5, all lettering being at least 1/6 inch high after reduction. When necessary, one large map or table can be accepted, if it will not exceed 17.5 inches in width after reduction. 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. Photostatic and typewritten material cannot be accepted as copy for illustrations. *Plates* (photographs) and figures (line drawings) should each be numbered consecutively through each article, using arabic numerals. If two photographs form one plate, they are figures A and B of that plate. All measurements should be given in SI (metric units).

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 to all subscribers to RADIOCARBON at \$20.00 US per copy.

List of laboratories. The comprehensive list of laboratories at the end of each volume appears in the third number of each volume. Changes in names or addresses should be reported to the Managing Editor by May 1.

Annual Index. All dates appear in index form at the end of the third number of each volume.

Radiocarbon

Published by THE AMERICAN JOURNAL OF SCIENCE

Editor MINZE STUIVER

. .

• •

Associate Editors

To serve until January 1, 1984 _ STEPHEN C PORTER Seattle, Washington

To serve until January 1, 1985 W G MOOK Groningen, The Netherlands HANS OESCHGER Bern, Switzerland

To serve until January 1, 1987 RONALD B DAVIS Orono, Maine

Editor at Large

Managing Editor

* RENEE S KRA

Proceedings of the Eleventh International Radiocarbon Conference—Seattle

. .

• •

Editors MINZE STUIVER and RENEE S KRA

Kline Geology Laboratory

Male University

New Haven, Connecticut 06511 https://doi.org/10.1017/S0033822200006160 Published online by Cambridge University Press



CONTENTS

FORWARD	ii
PARTICIPANTS	ix
I. NATURAL ¹⁴ C VARIATIONS	11
MGL Baillie, JR Pilcher, and GW Pearson Dendrochronology at Belfast as a Background to High-Precision Calibration	171
GW Pearson, JR Pilcher, and MGL Baillie High-Precision ¹⁴ C Measurement of Irish Oaks to Show the Natural ¹⁴ C Variations from 200BC to 4000 BC	179
GW Pearson and MGL Baillie High-Precision ¹⁴ C Measurement of Irish Oaks to Show the Natural Atmospheric ¹⁴ C Variations of the AD Time Period	187
Bernd Becker The Long-Term Radiocarbon Trend of the Absolute German Oak Tree-Ring Chronology, 2800 to 800 BC	197
CY Fan, Chen Tie-Mei, Yun Si-Xun, and Dai Kai-Mei Radiocarbon Activity Variation in Dated Tree Rings Grown in Mackenzie Delta	205
<i>JC Vogel</i> ¹⁴ C Variations During the Upper Pleistocene	213
Minze Stuiver Statistics of the AD Record of Climatic and Carbon Isotopic Change	219
Roy Thompson 14 C Dating and Magnetostratigraphy	229
RS Sternberg and PE Damon Atmospheric Radiocarbon: Implications for the Geomagnetic Dipole Moment	239
PE Damon, RS Sternberg, and CJ Radnell Modeling of Atmospheric Radiocarbon Fluctuations for the Past Three Centuries	249
Pavel Povinec Short-Term Variations in Radiocarbon Concentration with the 11-Year Solar Cycle	
Steven W Leavitt and Austin Long On a 50-Year "Climate-Free" ô ¹³ C Record from Juniper	259 ,
Tree Rings	267

Dichard Ra	, Michael Andrée, Hans Oeschger, Bernhard Stauffer, lzer, Georges Bonani, Christian Stoller, Martin Suter, fli, and Robert C Finkel ral De Variations in Ice	
Tempor	ral ¹⁰ Be Variations in Ice	
<i>JC Freundl</i> Calib:	ich and Burghart Schmidt rated ¹⁴ C Dates in Central Europe - Same as Elsewhere?	
CW Ferguso Dendr	n and DA Graybill ochronology of Bristlecone Pine: A Progress Report	
II. HYDRO	LOCY	
Mathe	, Jr, CJ Noronha, and RW Andrews matical Modeling of the Distribution of Natural ¹⁴ C, ³⁴ U, and ²³⁸ U in a Regional Ground-Water System	
1300	as, DW Fisher, DC Thorstenson, and EP Weeks and ¹⁴ CO ₂ Measurements on Soil Atmosphere Sampled in he Western Great Plains of the US	
DC Thorste Distr U	enson, EP Weeks, Herbert Haas, and DW Fisher ibution of Gaseous ¹² CO ₂ , ¹³ CO ₂ , and ¹⁴ CO ₂ in the Sub-Soil nsaturated Zone of the Western ² US Great Plains	
(chinger Atribution to the Interpretation of ¹⁴ C Groundwater Ages Considering the Example of a Partially Confirmed Sandstone Aquifer	
Grou	<i>and AL Mayo</i> ndwater Circulation in the Meade Thrust Allochthon Evaluated by Radiocarbon Techniques	
III. ¹⁴ C	APPLICATIONS	
Radi	Chein and Jiao Wen-Quiang Docarbon Profiles of Rocky Islet, Xi-Sha Islands: Evidence of Recent Crustal Movements in the South China Sea	
and JJ Sa	, Minze Stuiver, Herbert Haas, JE King, FB King unders	
Mid-	Wisconsinan Radiocarbon Dates from Mastodon- and Mammoth-Bearing Springs, Ozark Highland, Missouri	
<i>Ingrid U</i> Radi	Olsson ocarbon Dating in the Arctic Region	
Stud	ghui, Huang Baolin, and Wang Mingliang ies on Holocene Geochronology of the Coastal Region of Southern Fujian, China	
Mebus A G	eyh, Günter Roeschmann, TA Wijmstra, and AA Middeldorp Nepeliobility of ¹⁴ C Dates Obtained from Buried	

Henrik Tauber Possible Depletion in ¹⁴ C in Trees Growing in Calcareous Soils	417
Dušan Srdoč, Nada Horvatinčić, Bogomil Obelić, and Adela Sliepčević Radiocarbon Dating of Tufa in Paleoclimatic Studies	421
Youhanna Fares, JD Goeschl, CE Magnuson, CE Nelson, BR Strain, CH Jaeger, and EG Bilpuch A System for Studying Carbon Allocation in Plants Using C-Labeled Carbon Dioxide	429
BR Strain, JD Goeschl, CH Jaeger, Youhanna Fares, CE Magnuson, and CE Nelson	
Measurement of Carbon Fixation and Allocation Using ¹¹ C-Labeled Carbon Dioxide	441

IV. OCEANOGRAPHY

Ellen M Druffel Long-Term Variability of Temperature and ¹⁴ C in the Gulf Stream: Oceanographic Implications	449
Gerhard Kratz, GH Kohlmaier, EO Siré, Ursula Fischbach, and Horst Bröhl	
Carbon Exchange Between Atmosphere and Oceans in a Latitude-Dependent Advection-Diffusion Model	459

V. GENERAL ASPECTS OF ¹⁴C TECHNIQUE

Willem G Mook International Comparison of Proportional Gas Counters for ¹⁴ C Activity Measurements	475
Dušan Srdoč, Bogomil Obelić, and Nada Horvatinčić Radiocarbon Dating of Millimole-Sized Gaseous Samples	485
John C Sheppard, J Fred Hopper, and Yvonne Welter Radiocarbon Dating Archaeologic and Environmental Samples Containing 10 to 120 Milligrams of Carbon	493
<i>Reider Nydal</i> The Radon Problem in ¹⁴ C Dating	501
In Che Yang Evaluation of Direct-Precipitation and Gas-Evolution Methods for Radiocarbon Dating of Ground Water	511
WB Mann An International Reference Material for Radiocarbon Dating	519
Hector O Panarello, Miguel C Albero, and Fernando E Angiolini Stable Isotope Fractionation During Benzene Synthesis For Radiocarbon Dating	529

Austin Long, Richard Hendershott, and PS Martin Radiocarbon Dating of Fossil Eggshell	533
Fernando E Angiolini and Miguel C Albero A Secondary Standard for Radiocarbon Dating	541
Gert Hut, Jan Keyser, and Stef ₄ Wijma A Multiple Proportional ^C C Counter System for Milligram-Sized Samples	547
LA Currie, RW Gerlach, GA Klouda, FC Ruegg, and GB Tompkins Miniature Signals and Miniature Counters: Accuracy Assurance Via Microprocessors and Multiparameter Control Techniques	553
RL Otlet, G Huxtable, GV Evans, DC Humphreys, TD Short, and SJ Conchie Development and Operation of the Harwell Small Counter Facility for the Measurement of "C in Very Small Samples	565
Lauri Kaihola, Hannu Kojola, Henry Polach, Erkki Soini, and Robert Otlet An Evaluation of Shielding Characteristics Applicable to Mini- Gas Proportional Counter-Based ¹⁴ C Dating Systems	577

VI. ANTHROPOGENIC ¹⁴C VARIATIONS

Monika Segl, Ingeborg Levin, Hilla Schoch-Fischer, Marianne M Bernd Kromer, Jochen Tschiersch, and KO Münnich Anthropogenic ¹⁴ C Variations	
RL Otlet, AJ Walker, and H Longley The Use of ¹⁴ C in Natural Materials to Establish the Ave Gaseous Dispersion Patterns of Releases from Nuclean Installations	n
LA Currie, GA Klouda, RE Continetti, IR Kaplan, WW Wong, TG Dzubay, and RK Stevens On the Origin of Carbonaceous Particles in American Cit of Radiocarbon "Dating" and Chemical Characterizatio	ies: Results on 603
Rainer Berger, RM Johnson, and JR Holmes Radiocarbon Measurements of Particulates in Smog	
WR Schell, JR Swanson, and LA Currie Anthropogenic Changes in Organic Carbon and Trace Metal Input to Lake Washington	
Ellen M Druffel and Henry YI Mok Time History of Human Gallstones: Application of the Post-Bomb Radiocarbon Signal	

VII. ARCHAEOLOGY

HT Waterbolk	
The Integration of Radiocarbon Dating in Archaeology	639
Horst Willkomm The Reliability of Archaeologic Interpretation of Radiocarbon Dates	645
RE Taylor Non-Concordance of Radiocarbon and Amino Acid Racemization- Deduced Age Estimates on Human Bone: Implications for the Dating of the Earliest <i>Homo Sapiens</i> in the New World	
Rainer Berger Direct Bone Dating in a Small CO ₂ Counter	655
Steinar Gulliksen Radiocarbon Database: A Pilot Project	661
JC Moffett and RE Webb Database Management Systems, Radiocarbon, and Archaeology	667
Richard Burleigh and AD Baynes-Cope Possibilities in the Dating of Writing Materials and Textiles	669
VIII. TECHNICAL ASPECTS OF ACCELERATOR MASS SPECTROMETRY	
Accelerator Mass Spectrometry: From Nuclear Physics to Dating	677
DE Nelson, RG Korteling, JR Southon, JS Vogel, I Nowikow, TL Ku, Masashi Kusakabe, and JL Reyss Tandem Accelerator Measurements of ¹⁰ Be Deposition Rates	693
RM Brown, HR Andrews, GC Ball, N Burn, WG Davies, Y Imahori, JCD Milton, and W Workman Recent ¹⁴ C Measurements with the Chalk River Tandem Accelerator	
Recent C Measurements with the Chalk River Tandem Accelerator	701
GW Farwell, PM_Grootes, DD Leach, FH Schmidt, and Minze Stuiver Current ¹ C Measurements with the University of Washington Accelerator Facility for Radioisotope Dating	711
DJ Donahue, TH Zabel, AJT Jull, PE Damon, and KH Purser Results of Tests and Measurements from the NSF Regional Accelerator Facility for Radioisotope Dating	719
Richard Gillespie, REM Hedges, and NR White The Oxford Radiocarbon Accelerator Facility	-
^v Van der Borg, JA Hoogenboom, RA Jelmersma. Abraham Vermeer	
and Gert Hut Radiocarbon Dating with the Utrecht Tandem Accelerator	739

Willy Woelfli, Georges Bonani, Martin Suter, Richard Balzer, Marzio Nessie, Christian Stoller, Juerg Beer. Hans Oeschger, and Michael Andree Radioisotope Dating with the ETHZ-EN Tandem Accelerator	745
GW Farwell, PM Grootes, DD Leach, and FH Schmidt Technological Advances in the University of Washington Accelerator Mass Spectrometry System	755
Jan Heinemeier and Hans Henrik Andersen Production of C ⁻ Directly from CO ₂ Using the ANIS Sputter Source	761
Richard Gillespie and Robert EM Hedges Sample Chemistry for the Oxford High Energy Mass Spectrometer	771
JS Vogel, IG Nowikow, JR Southon, and DE Nelson Survey of Simple Carbon Compounds for Use in a Negative Ion Sputter Source	775
Michael Paul, Oded Meirav, Walter Henning, Walter Kutschera, Robert Kaim, Mark B Goldberg, Jean Gerber, William Hering, Aaron Kaufman,	
and Mordeckai Magaritz Detection of the ³⁶ Cl Radioisotope at the Rehovot 14UD Pelletron Accelerator	785

BUSINESS MEETING

Minze Stuiver	
International Agreements and the Use of the New Oxalic	700
Acid Standard	793