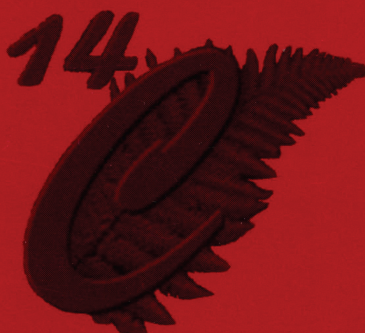


# Radiocarbon

An International Journal of Cosmogenic Isotope Research

VOLUME 46 / NUMBER 2 / 2004



**Proceedings of the 18th International  
Radiocarbon Conference**  
Wellington, New Zealand  
September 1–5, 2003

**Part 2 of 2**

**Conference Editors**  
NANCY BEAVAN ATHFIELD  
RODGER J SPARKS

Department of Geosciences  
The University of Arizona  
4717 East Fort Lowell Road  
Tucson, Arizona 85712-1201 USA

ISSN: 0033-8222

## **RADIOCARBON**

An International Journal of Cosmogenic Isotope Research

*Editor:* A J T JULL

*Associate Editors:* J WARREN BECK, GEORGE S BURR, AND GREGORY WL HODGINS

*Managing Editor:* MARK E MCCLURE

*Assistant Editor:* TASHA ADAMS, ROY A RAMOS

*Business Manager:* AGNIESZKA P BAIER

*Subscriptions and Sales Manager:* KRISTA LINDSAY

Published by  
Department of Geosciences  
The University of Arizona

Published three times a year at The University of Arizona, Tucson, AZ 85712-1201 USA.

© 2004 by the Arizona Board of Regents on behalf of the University of Arizona. All rights reserved.

*Subscription rate* (2004): \$200.00 (institutions), \$100.00 (individuals). Foreign postage is extra. A complete price list, including proceedings of international conferences, special publications and back issues, appears on the back pages of this issue. *Advertising rates* available upon request, or see [www.radiocarbon.org/adrates.html](http://www.radiocarbon.org/adrates.html).

*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.

*Authors:* See our "Information for Authors" document at [www.radiocarbon.org/Authors/](http://www.radiocarbon.org/Authors/) for guidelines on manuscript submission and format. All correspondence and manuscripts should be addressed to the Managing Editor, *RADIOCARBON*, Department of Geosciences, The University of Arizona, 4717 East Fort Lowell Road, Tucson, AZ 85712-1201 USA. Tel.: +1 520 881-0857; Fax: +1 520 881-0554; Email: [editor@radiocarbon.org](mailto:editor@radiocarbon.org).

*List of laboratories.* Our comprehensive list of laboratories is published annually, and is also available at [www.radiocarbon.org/Info/lablist.html](http://www.radiocarbon.org/Info/lablist.html). We ask all laboratory directors to provide their laboratory code designation, as well as current telephone and fax numbers, and email addresses. Changes in names or addresses, additions or deletions should be reported to the managing editor. Conventional and AMS laboratories are arranged in alphabetical order by country, and we include laboratories listed by code designation.

*RADIOCARBON* on the World Wide Web: <http://www.radiocarbon.org/>

*RADIOCARBON* is indexed and/or abstracted by the following sources: *Anthropological Index; Anthropological Literature; Art and Archaeology Technical Abstracts; Bibliography and Index of Geology (GeoRef); British Archaeological Bibliography; Chemical Abstracts; Chemistry Citation Index; Current Advances in Ecological and Environmental Sciences; Current Contents (ISI); FRANCIS (Institut de l'Information Scientifique et Technique – CNRS); Geographical Abstracts; Geological Abstracts; Oceanographic Literature Review; Science Citation Index; Social Sciences Citation Index.*



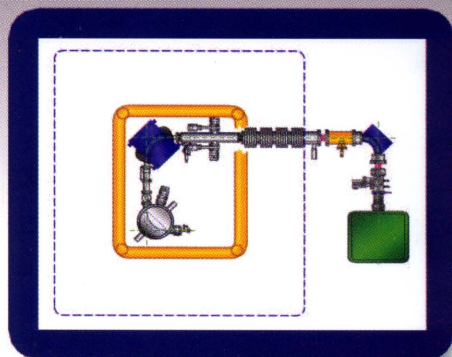
# COMPACT CARBON AMS

## Accelerator Mass Spectrometry Tandem and Single Stage

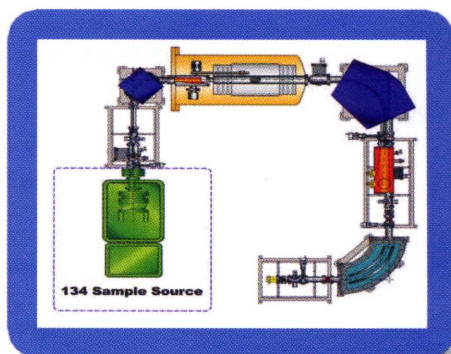
**National Electrostatics Corporation** offers a wide variety of compact, low voltage AMS systems for carbon radio isotope ratio measurement. All NEC systems provide high precision and low background. They can be equipped with the high throughput, multi-sample ion source or dual ion source injector for added versatility.

### FEATURES INCLUDE:

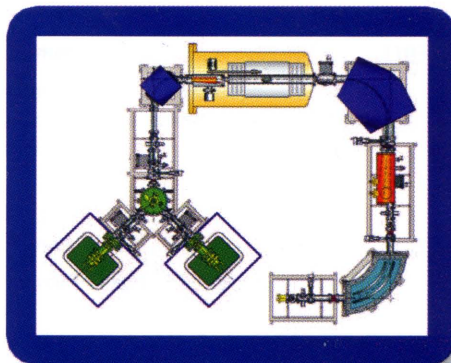
- Better than 5 per mil precision
- Better than  $5 \times 10^{-15}$  background
- Throughput of 400 samples/day to 2% precision for modern carbon with the 134 sample source
- Gas and solid sample source
- All metal/ceramic acceleration tubes with no organic material in the vacuum volume



**Single Stage AMS**



**High Through-put  
Compact Carbon AMS**



**Multi Ion Source  
Compact Carbon AMS**



7540 Graber Road, P.O. Box 620310  
Middleton, WI USA, 53562-0310

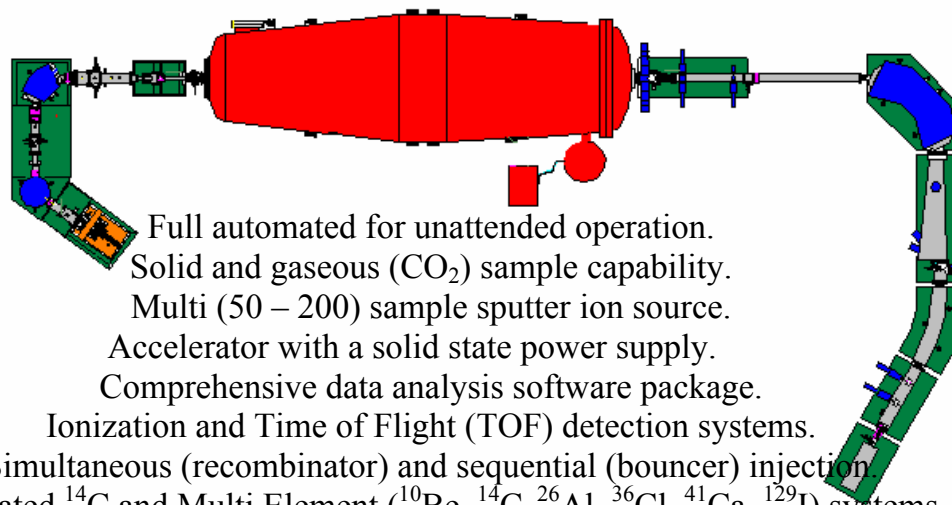
Phone: 608-831-7600 • Fax: 608-831-9591  
nec@pelletron.com • www.pelletron.com

# TANDETRON ACCELERATOR MASS SPECTROMETERS

Dedicated and Multi element systems

**‘The choice is yours....’**

1.0MV, 2.0MV, 3.0MV or 5.0MV



Full automated for unattended operation.  
Solid and gaseous (CO<sub>2</sub>) sample capability.  
Multi (50 – 200) sample sputter ion source.  
Accelerator with a solid state power supply.  
Comprehensive data analysis software package.  
Ionization and Time of Flight (TOF) detection systems.  
Simultaneous (recombinator) and sequential (bouncer) injection.  
Dedicated <sup>14</sup>C and Multi Element (<sup>10</sup>Be, <sup>14</sup>C, <sup>26</sup>Al, <sup>36</sup>Cl, <sup>41</sup>Ca, <sup>129</sup>I) systems.



**HIGH VOLTAGE ENGINEERING EUROPA B.V.**

Amsterdamsseweg 63, 3812 RR Amersfoort, P.O. Box 99, 3800 AB Amersfoort, The Netherlands  
Phone: +31-33-4619741. Fax +31-33-4615291. Trade register Amersfoort nr. 31014544  
E-mail: [info@highvolteng.com](mailto:info@highvolteng.com) – Web: [www.highvolteng.com](http://www.highvolteng.com)





**CONTENTS**

<b>EDITORIAL BOARD</b> .....	ix
------------------------------	----

<b>SPONSORS</b> .....	xi
-----------------------	----

<b>FROM THE GUEST EDITORS</b> .....	xiii
-------------------------------------	------

<b>LIST OF PARTICIPANTS</b> .....	xix
-----------------------------------	-----

**ARTICLES****AMS Methods and Developments**

Initial Results with Low Energy Single Stage AMS <i>J B Schroeder, T M Hauser, G M Klody, G A Norton</i> .....	1
-------------------------------------------------------------------------------------------------------------------	---

Pushing the Precision Limit of <sup>14</sup> C AMS <i>Peter Steier, Franz Dellinger, Walter Kutschera, Alfred Priller, Werner Rom, Eva Maria Wild</i> .....	5
----------------------------------------------------------------------------------------------------------------------------------------------------------------	---

Towards High-Precision AMS: Progress and Limitations <i>Christopher Bronk Ramsey, Thomas Higham, Philip Leach</i> .....	17
----------------------------------------------------------------------------------------------------------------------------	----

Using a Gas Ion Source for Radiocarbon AMS and GC-AMS <i>Christopher Bronk Ramsey, Peter Ditchfield, Martin Humm</i> .....	25
-------------------------------------------------------------------------------------------------------------------------------	----

Ion Source Development at KCCAMS, University of California, Irvine <i>J R Southon, G M Santos</i> .....	33
------------------------------------------------------------------------------------------------------------	----

The Keck Carbon Cycle AMS Laboratory, University Of California, Irvine: Initial Operation and a Background Surprise <i>John Southon, Guaciara Santos, Kevin Druffel-Rodriguez, Ellen Druffel, Sue Trumbore, Xiaomei Xu, Sheila Griffin, Shahla Ali, Maya Mazon</i> .....	41
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----

The New <sup>14</sup> C Analysis Laboratory in Jena, Germany <i>A Steinhof, G Adamiec, G Gleixner, GJ van Klinken, T Wagner</i> .....	51
------------------------------------------------------------------------------------------------------------------------------------------	----

Capabilities of the New SUERC 5MV AMS Facility for <sup>14</sup> C Dating <i>S Xu, R Anderson, C Bryant, G T Cook, A Dougans, S Freeman, P Naysmith, C Schnabel, E M Scott</i> .....	59
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----

Direct Coupling of an Elemental Analyzer and a Hybrid Ion Source for AMS Measurements <i>Thomas Uhl, Wolfgang Kretschmer, Wolfgang Luppold, Andreas Scharf</i> .....	65
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----

Fast and Accurate Sequential Injection AMS with Gated Faraday Cup Current Measurement <i>M Klein, D J W Mous, A Gott dang</i> .....	77
----------------------------------------------------------------------------------------------------------------------------------------	----

<sup>10</sup> Be Analyses with a Compact AMS Facility—Are BeF <sub>2</sub> Samples the Solution? <i>L Wacker, M Grajcar, S Ivy-Ochs, PW Kubik, M Suter</i> .....	83
---------------------------------------------------------------------------------------------------------------------------------------------------------------------	----

Simulation Study for the Separation of Rare Isotopes at the Seoul National University AMS Facility <i>C C Yun, C S Lee, M Youn, J C Kim</i> .....	89
------------------------------------------------------------------------------------------------------------------------------------------------------	----

**Liquid Scintillation**

Surface and Underground Ultra Low-Level Liquid Scintillation Spectrometry <i>Wolfgang Plastino, Lauri Kaihola</i> .....	97
----------------------------------------------------------------------------------------------------------------------------	----

Measurement of Low $^{14}\text{C}$ Activities in a Liquid Scintillation Counter in the Zagreb Radiocarbon Laboratory <i>Nada Horvatinčić, Jadranka Barešić, Ines Krajcar Bronić, Bogomil Obelić</i> .....	105
Rehabilitation of the Laboratoire De Carbone 14-Dakar (Senegal) with a Super Low-Level Liquid Scintillation Counting System <i>Maurice Ndeye, Oumar Ka, Hamady Bocoum, Alpha O Diallo</i> .....	117
Towards Achieving Low Background Levels in Routine Dating by Liquid Scintillation Spectrometry <i>Alan G Hogg</i> .....	123
<b>Sample Processing</b>	
Preparation of Graphite Targets from Small Marine Samples for AMS Radiocarbon Measurements <i>Laval Liong Wee Kwong, Pavel P Povinec, A J Timothy Jull</i> .....	133
Development of a Combustion System for Liquid or Gas Samples <i>J H Park, C S Lee</i> .....	141
A Pretreatment Procedure for the AMS Radiocarbon Dating of Sub-Fossil Insect Remains <i>J A Tripp, T F G Higham, R E M Hedges</i> .....	147
Improvements to the Pretreatment of Bone at Oxford <i>Christopher Bronk Ramsey, Thomas Higham, Angela Bowles, Robert Hedges</i> .....	155
Magnesium Perchlorate as an Alternative Water Trap in AMS Graphite Sample Preparation: A Report on Sample Preparation at KCCAMS at the University of California, Irvine <i>G M Santos, J R Southon, K C Druffel-Rodriguez, S Griffin, M Mazon</i> .....	165
Radiocarbon Dating of Iron Artifacts at the Erlangen AMS Facility <i>Andreas Scharf, Wolfgang Kretschmer, Gerhard Morgenroth, Thomas Uhl, Karin Kritzler, Katja Hunger, Ernst Pernicka</i> .....	175
Extraction and AMS Radiocarbon Dating of Pollen from Lake Baikal Sediments <i>Natalia Piotrowska, Andrzej Bluszcz, Dieter Demske, Wojciech Granoszewski, Georg Heumann</i> .....	181
$^{14}\text{C}$ Ages of Ostracodes from Pleistocene Lake Sediments of the Western Great Basin, USA—Results of Progressive Acid Leaching <i>Irka Hajdas, Georges Bonani, Susan Herrgesell Zimmerman, Millie Mendelson, Sidney Hemming</i> .....	189
Preliminary Results for the Extraction and Measurement of Cosmogenic In Situ $^{14}\text{C}$ from Quartz <i>P Naysmith, G T Cook, W M Phillips, N A Lifton, R Anderson</i> .....	201
Problems Associated with the AMS Dating of Small Bone Samples: The Question of the Arrival of Polynesian Rats to New Zealand <i>T F G Higham, R E M Hedges, A J Anderson, C Bronk Ramsey, B Fankhauser</i> .....	207
AMS $^{14}\text{C}$ Dating of Iron Artifacts: Development and Application <i>Hiroki Enami, Toshio Nakamura, Hirotaka Oda, Tetsuya Yamada, Toshio Tsukamoto</i> .....	219
<b>Archaeology</b>	
$^{14}\text{C}$ Dating Compared to Art Historical Dating of Roman and Coptic Textiles from Egypt <i>Mark Van Strydonck, Antoine De Moor, Dominique Bénazeth</i> .....	231
Radiocarbon Dating of Sopot Culture Sites (Late Neolithic) in Eastern Croatia <i>Bogomil Obelić, Marija Krznarić Škrivanko, Boško Marijan, Ines Krajcar Bronić</i> .....	245



Chronology and Possible Links Between Climatic and Cultural Change During the First Millennium BC in Southern Siberia and Central Asia <i>G I Zaitseva, B van Geel, N A Bokovenko, K V Chugunov, V A Dergachev, V G Dirksen, M A Koukova, A Nagler, G Parzinger, J van der Plicht, N D Bourova, L M Lebedeva</i> . . . . .	259
Chronological Studies of the Arzhan-2 Scythian Monument in Tuva (Russia) <i>G I Zaitseva, K V Chugunov, V A Dergachev, A Nagler, G Parzinger, E M Scott, A A Sementsov, S Vasiliev, B van Geel, J van der Plicht, L M Lebedeva</i> . . . . .	277
A Puzzling Body from the River Thames in London <i>Alex Bayliss, Peter Marshall, Jane Sidell</i> . . . . .	285
Radiocarbon and Stable Isotope Evidence of Dietary Change from the Mesolithic to the Middle Ages in the Iron Gates: New Results from Lepenski Vir <i>C Bonsall, G T Cook, R E M Hedges, T F G Higham, C Pickard, I Radovanović</i> . . . . .	293
A Review of the Evidence for Extinction Chronologies for Five Species of Upper Pleistocene Megafauna in Siberia <i>Lyobov A Orlova, Yaroslav V Kuzmin, Vyacheslav N Dementiev</i> . . . . .	301
The End of the Chalcolithic Period in the South Jordan Valley: New <sup>14</sup> C Determinations from Teleilat Ghassul, Jordan <i>Stephen Bourke, Ugo Zoppi, John Meadows, Quan Hua, Samantha Gibbins</i> . . . . .	315
Dating the Volcanic Eruption at Thera <i>Christopher Bronk Ramsey, Sturt W Manning, Mariagrazia Galimberti</i> . . . . .	325
Chronology of the Beginning of Pottery Manufacture in East Asia <i>Charles T Keally, Yasuhiro Taniguchi, Yaroslav V Kuzmin, Igor Y Shewkomud</i> . . . . .	345
Chronology of Prehistoric Cultural Complexes of Sakhalin Island (Russian Far East) <i>Yaroslav V Kuzmin, Alexander A Vasilevski, Sergei V Gorbunov, G S Burr, A J Timothy Jull, Lyobov A Orlova, Olga A Shubina</i> . . . . .	353
Lugovskoe, Western Siberia: A Possible Extra-Arctic Mammoth Refugium at the End of the Late Glacial <i>Lyobov A Orlova, Vasily N Zenin, Anthony J Stuart, Thomas F G Higham, Pieter M Grootes, Sergei V Leshchinsky, Yaroslav V Kuzmin, Aleksander F Pavlov, Evgeny N Maschenko</i> . . . . .	363
Radiocarbon Dating of <i>Kohitsugire</i> (Paper Fragments) Attributed to Japanese Calligraphists in the Heian–Kamakura Period <i>Hirota Oda, Kazuomi Ikeda, Takashi Masuda, Toshio Nakamura</i> . . . . .	369
Neolithic Massacres: Local Skirmishes or General Warfare in Europe? <i>Eva Maria Wild, Peter Stadler, Annemarie Häußler, Walter Kutschera, Peter Steier, Maria Teschler-Nicola, Joachim Wahl, Helmut J Windl</i> . . . . .	377
<sup>14</sup> C Dating of the Settlement of Iceland <i>Arny E Sveinbjörnsdóttir, Jan Heinemeier, Gardar Gudmundsson</i> . . . . .	387
Anomalous Radiocarbon Dates from Easter Island <i>Kevin Butler, Christine A Prior, John R Flenley</i> . . . . .	395
AMS <sup>14</sup> C Dating Using Black Pottery and Fiber Pottery <i>Shozo Mihara, Kazuo Miyamoto, Hidefumi Ogawa, Teiji Kurosaka, Toshio Nakamura, Hiroko Koike</i> . . . . .	407
<b>Soils</b>	
Dating of Total Soil Organic Matter Used in Kurgan Studies <i>M Molnár, K Joó, A Barczy, Zs Szántó, I Futó, L Palcsu, L Rinyu</i> . . . . .	413
Calculating Sediment Compaction for Radiocarbon Dating of Intertidal Sediments <i>M I Bird, L K Fifield, S Chua, B Goh</i> . . . . .	421

Preliminary <sup>14</sup> C Dates on Bulk Soil Organic Matter from the Black Creek Megafauna Fossil Site, Rocky River, Kangaroo Island, South Australia <i>Matt Forbes, Erick Bestland, Rod Wells</i> . . . . .	437
<sup>10</sup> Be, <sup>14</sup> C Distribution, and Soil Production Rate in a Soil Profile of a Grassland Slope at Heshan Hilly Land, Guangdong <i>CD Shen, J Beer, S Ivy-Ochs, Y Sun, W Yi, P W Kubik, M Suter, Z Li, S Peng, Y Yang</i> . . . . .	445
A Novel Approach for Developing High-Resolution Sub-Fossil Peat Chronologies with <sup>14</sup> C Dating <i>T H Donders, F Wagner, K van der Borg, A F M de Jong, H Visscher</i> . . . . .	455
Complexity of Soil Organic Matter: AMS <sup>14</sup> C Analysis of Soil Lipid Fractions and Individual Compounds <i>Janet Rethemeyer, Christiane Kramer, Gerd Gleixner, Guido L B Wiesenberg, Lorenz Schwark, Nils Andersen, Marie-J Nadeau, Pieter M Grootes</i> . . . . .	465

## Atmosphere

Source Apportionment of Aerosols by <sup>14</sup> C Measurements In Different Carbonaceous Particle Fractions <i>S Szidat, T M Jenk, H W Gäggeler, H-A Synal, R Fisseha, U Baltensperger, M Kalberer, V Samburova, L Wacker, M Saurer, M Schwikowski, I Hajdas</i> . . . . .	475
Temporal Variation of Radiocarbon Concentration in Airborne Particulate Matter in Tokyo <i>Ken Shibata, Michio Endo, Naomichi Yamamoto, Jun Yoshinaga, Yukio Yanagisawa, Osamu Endo, Sumio Goto, Minoru Yoneda, Yasuyuki Shibata, Masatoshi Morita</i> . . . . .	485
Pathways for Escape of Magmatic Carbon Dioxide to Soil Air at Unzen Volcano, SW Japan <i>Hiroshi A Takahashi, Kohei Kazahaya, Hiroshi Shinohara, Toshio Nakamura</i> . . . . .	491

## PART II

### Groundwater

A Direct Estimate of the Initial Concentration of <sup>14</sup> C in the Mountain Aquifer of Israel <i>Israel Carmi, Joel Kronfeld, Yoseph Yechieli, Elisabetta Boaretto, Miryam Bar-Matthews, Avner Ayalon</i> . . . . .	497
Time-Dependent Factors Inherent in the Age Equation for Determining Residence Times of Groundwater Using <sup>14</sup> C: A Procedure to Compensate for the Past Variability of <sup>14</sup> C in Atmospheric Carbon Dioxide, with Application to the Wairau Deep Aquifer, Marlborough, New Zealand <i>Claude B Taylor</i> . . . . .	501
Paleogroundwater in the Moutere Gravel Aquifers near Nelson, New Zealand <i>Michael K Stewart, Joseph T Thomas, Margaret Norris, Vanessa Trompeter</i> . . . . .	517

### Marine and Freshwater Environments

Radiocarbon Reservoir Age Variations in the South Peruvian Upwelling During the Holocene <i>Michel Fontugne, Matthieu Carré, Ilhem Bentaleb, Michèle Julien, Danièle Lavallée</i> . . . . .	531
Radiocarbon Ages and Isotope Fractionations of Beachrock Samples Collected from the Nansei Islands, Southwestern Japan <i>Kunio Omoto</i> . . . . .	539
Paired <sup>14</sup> C and <sup>230</sup> Th/U Dating of Surface Corals from the Marquesas and Vanuatu (Sub-Equatorial Pacific) in the 3000 to 15,000 cal yr Interval <i>Martine Paterne, Linda K Ayliffe, Maurice Arnold, Guy Cabioch, Nadine Tisnérat-Laborde, Christine Hatté, Eric Douville, Edouard Bard</i> . . . . .	551



Oceanic Radiocarbon and Tritium on a Transect between Australia and Bali (Eastern Indian Ocean)	
<i>Viviane Leboucher, Philippe Jean-Baptiste, Elise Fourré, Maurice Arnold, Michèle Fieux . . .</i>	567
Radiocarbon in the Water Column of the Southwestern North Pacific Ocean—24 Years After GEOSECS	
<i>Pavel P Povinec, Takafumi Aramaki, George S Burr, A J Timothy Jull, Laval Liong Wee Kwong, Orihiko Togawa . . . . .</i>	583
Interannual <sup>14</sup> C Variations During 1977–1998 Recorded in Coral from Daya Bay, South China Sea	
<i>C D Shen, W X Yi, K F Yu, Y M Sun, Y Yang, B Zhou . . . . .</i>	595
Marine Reservoir Correction for the Cocos (Keeling) Islands, Indian Ocean	
<i>Quan Hua, Colin D Woodroffe, Mike Barbetti, Scott G Smithers, Ugo Zoppi, David Fink . . .</i>	603
Holocene Variations in the Scottish Marine Radiocarbon Reservoir Effect	
<i>Philippa L Ascough, Gordon T Cook, Andrew J Dugmore, John Barber, Elaine Higney, E Marian Scott . . . . .</i>	611
Radiocarbon Reservoir Ages from Freshwater Lakes, South Georgia, Sub-Antarctic: Modern Analogues from Particulate Organic Matter and Surface Sediments	
<i>Steven G Moreton, Gunhild C Rosqvist, Sarah J Davies, Michael J Bentley . . . . .</i>	621
Variability of Monthly Radiocarbon During the 1760s in Corals from the Galapagos Islands	
<i>Ellen R M Druffel, Sheila Griffin, Jeomshik Hwang, Tomoko Komada, Steven R Beaupre, Kevin C Druffel-Rodriguez, Guaciara M Santos, John Southon . . . . .</i>	627
Radiocarbon in Porewater of Continental Shelf Sediments (Southeast Mediterranean)	
<i>O Sivan, B Lazar, E Boaretto, Y Yecheili, B Herut . . . . .</i>	633
Seasonal Radiocarbon Variation of Surface Seawater Recorded in a Coral from Kikai Island, Subtropical Northwestern Pacific	
<i>Maki Morimoto, Hiroyuki Kitagawa, Yasuyuki Shibata, Hajime Kayanne . . . . .</i>	643
Temporal Changes in Radiocarbon Reservoir Age in the Dead Sea-Lake Lisan System	
<i>Mordechai Stein, Claudia Migowski, Revital Bookman, Boaz Lazar . . . . .</i>	649
Marine Reservoir Correction in the South of Vietnam Estimated from an Annually-Banded Coral	
<i>Phong X Dang, Takehiro Mitsuguchi, Hiroyuki Kitagawa, Yasuyuki Shibata, Toshiyuki Kobayashi . . . . .</i>	657
<b>Past Environments</b>	
The ‘Sterno-Etrussia’ Geomagnetic Excursion Around 2700 BP and Changes of Solar Activity, Cosmic Ray Intensity, and Climate	
<i>V A Dergachev, O M Raspopov, B van Geel, G I Zaitseva . . . . .</i>	661
The Cosmic Ray Increases at 35 and 60 kyr BP	
<i>V Florinski, W I Axford, G P Zank . . . . .</i>	683
Holocene Environmental Changes in Western Hungary	
<i>Zsuzsanna Szántó, Zsófia Medzihradzky . . . . .</i>	691
Carbon Isotopic Composition of Tree Rings as a Tool for Biomonitoring CO <sub>2</sub> Level	
<i>Stawomira Pawełczyk, Anna Pazdur . . . . .</i>	701
An AMS <sup>14</sup> C Pollen-Dated Sediment and Pollen Sequence from the Late Holocene, Southern Coastal Hawke’s Bay, New Zealand	
<i>Pamela I Chester, Christine A Prior . . . . .</i>	721
Shape Analysis of Cumulative Probability Density Function of Radiocarbon Dates Set in the Study of Climate Change in the Late Glacial and Holocene	
<i>Danuta J Michczyńska, Anna Pazdur . . . . .</i>	733

Radiocarbon Chronology of the Late Pleistocene–Holocene Paleogeographic Events in the Lake Baikal Region (Siberia) <i>Sergey K Krivonogov, Hikaru Takahara, Yaroslav V Kuzmin, Lyobov A Orlova, A J Timothy Jull, Toshio Nakamura, Norio Miyoshi, Kimiyasu Kawamuro, Elena V Bezrukova</i> . . . . .	745
Changes in Sediment Accumulation Rate in an Oxbow Lake Following Late 19th Century Clearing of Land for Agricultural Use: A <sup>210</sup> Pb, <sup>137</sup> Cs, and <sup>14</sup> C Study in Mississippi, USA <i>Gregg R Davidson, Meredith Carnley, Todd Lange, Stanley J Galicki, Andrew Douglas</i> . . . . .	755
Late Holocene Environmental Reconstruction of St. Michiel Saline Lagoon, Curaçao (Dutch Antilles) <i>Bogumila B Klosowska, Simon R Troelstra, Jan E van Hinte, Klaas van der Borg, Arie F M de Jong</i> . . . . .	765
On the Erosive Trail of a 14th and 15th Century Hurricane in Connecticut (USA) Salt Marshes <i>O van de Plassche, A J Wright, K van der Borg, A F M de Jong</i> . . . . .	775
Near-Zero $\Delta^{14}\text{C}$ Values at 32 kyr cal BP Observed in the High-Resolution <sup>14</sup> C Record from U-Th Dated Sediment of Lake Lisan <i>K van der Borg, M Stein, A F M de Jong, N Waldmann, S L Goldstein</i> . . . . .	785
Holocene Evolution of the Outer Lake of Hwajnpo Lagoon on the Eastern Coast of Korea; Environmental Changes with Holocene Sea-Level Fluctuation of the East Sea (Sea of Japan) <i>Jong-Gwon Yum, Kang-Min Yu, Keiji Takemura, Toshiro Naruse, Akihisa Kitamura, Hiroyuki Kitagawa, Jong-Chan Kim</i> . . . . .	797
<sup>14</sup> C Chronology of Mesolithic Sites from Poland and the Background of Environmental Changes <i>Anna Pazdur, Mariusz Fogtman, Adam Michczyński, Jacek Pawlyta, Mirosław Zajac</i> . . . . .	809
<b>The Modern Environment</b>	
<sup>14</sup> C Sources and Distribution in the Vicinity of La Hague Nuclear Reprocessing Plant: Part I—Terrestrial Environment <i>M Fontugne, D Maro, Y Baron, C Hatté, D Hebert, E Douville</i> . . . . .	827
<sup>14</sup> C Sources and Distribution in the Vicinity of La Hague Nuclear Reprocessing Plant: Part II—Marine Environment <i>D Maro, M Fontugne, C Hatté, D Hebert, M Rozet</i> . . . . .	831
Testing the Use of Bomb Radiocarbon to Date the Surface Layers of Blanket Peat <i>M H Garnett, A C Stevenson</i> . . . . .	841
Differentiating Bone Osteonal Turnover Rates by Density Fractionation; Validation Using the Bomb <sup>14</sup> C Atmospheric Pulse <i>Ji Young Shin, Tamsin O'Connell, Stuart Black, Robert Hedges</i> . . . . .	853
Levels of <sup>14</sup> C in the Terrestrial Environment in the Vicinity of Two European Nuclear Power Plants <i>Åsa Magnusson, Kristina Stenström, Göran Skog, Diana Adliene, Gediminas Adlys, Ragnar Hellborg, Agata Olariu, Mohamad Zakaria, Christopher Rääf, Sören Mattsson</i> . . . . .	863
Sources of Anthropogenic <sup>14</sup> C to the North Sea <i>P Gulliver, G T Cook, A B MacKenzie, P Naysmith, R Anderson</i> . . . . .	869
Sellafield-Derived Anthropogenic <sup>14</sup> C in the Marine Intertidal Environment of the NE Irish Sea <i>G T Cook, A B MacKenzie, G K P Muir, G Mackie, P Gulliver</i> . . . . .	877
Spatial and Temporal Impacts of <sup>14</sup> C Releases from the Sellafield Nuclear Complex on the Irish Coastline <i>Sinead M Keogh, Edward J McGee, Donal Gallagher, Peter I Mitchell</i> . . . . .	885
Stepped-Combustion <sup>14</sup> C Dating of Bomb Carbon in Lake Sediment <i>J McGeehin, G S Burr, G Hodgins, S J Bennett, J A Robbins, N Morehead, H Markewich</i> . . . . .	893



Seasonal and Secular Variations of Atmospheric $^{14}\text{CO}_2$ Over the Western Pacific Since 1994 <i>H Kitagawa, Hitoshi Mukai, Yukihiko Nojiri, Yasuyuki Shibata, Toshiyuki Kobayashi, Tomoko Nojiri</i> .....	901
<b>Tree Rings</b>	
Radiocarbon Concentration in the Atmosphere and Modern Tree Rings in the Kraków Area, Southern Poland <i>Andrzej Rakowski, Tadeusz Kuc, Toshio Nakamura, Anna Pazdur</i> .....	911
Wiggle-Match Dating of Tree-Ring Sequences <i>Mariagrazia Galimberti, Christopher Bronk Ramsey, Sturt W Manning</i> .....	917
Radiocarbon in Annual Tree Rings from Thailand During the Pre-Bomb Period, AD 1938–1954 <i>Quan Hua, Mike Barbetti, Ugo Zoppi</i> .....	925
Tree-Ring Records of Near-Younger Dryas Time in Central North America—Preliminary Results from the Lincoln Quarry Site, Central Illinois, USA <i>Irina P Panyushkina, Steven W Leavitt, Alex Wiedenhoeft, Sarah Noggle, Brandon Curry, Eric Grimm</i> .....	933
The Comparison of $^{14}\text{C}$ Wiggle-Matching Results for the ‘Floating’ Tree-Ring Chronology of the Ulandryk-4 Burial Ground (Altai Mountains, Siberia) <i>Yaroslav V Kuzmin, Igor Y Slusarenko, Irka Hajdas, Georges Bonani, J Andres Christen</i> . . . .	943
$^{14}\text{C}$ Concentrations of Single-Year Tree Rings from about 22,000 Years Ago Obtained Using a Highly Accurate Measuring Method <i>Toshiyuki Gandou, Hirohisa Sakurai, Wataru Katoh, Yousuke Takahashi, Syuichi Gunji, Fuyuki Tokanai, Hiroyuki Matsuzaki</i> .....	949
Interpreting Radiocarbon Dates Using Evidence from Tree Rings <i>Alex Bayliss, Ian Tyers</i> .....	957
Variation of the Radiocarbon Content in Tree Rings During the Spoerer Minimum <i>Hiroko Miyahara, Kimiaki Masuda, Hideki Furuzawa, Hiroaki Menjo, Yasushi Muraki, Hiroyuki Kitagawa, Toshio Nakamura</i> .....	965
<b>Radiocarbon Calibration</b>	
A $^{14}\text{C}$ Calibration with AMS from 3500 to 3000 BC, Derived from a New High-Elevation Stone- Pine Tree-Ring Chronology <i>Franz Dellinger, Walter Kutschera, Peter Steier, Eva Maria Wild, Kurt Nicolussi, Peter Schießling</i> .....	969
Bayesian Periodic Signal Detection Applied to INTCAL98 Data <i>V Palonen, P Tikkanen</i> .....	979
Radiocarbon/Tree-Ring Calibration, Solar Activity, and Upwelling of Ocean Water <i>F B Knox, B G McFadgen</i> .....	987
Influence of $^{14}\text{C}$ Concentration Changes in the Past on Statistical Inference of Time Intervals <i>Adam Michczyński</i> .....	997
New $\Delta R$ Values for the Southwest Pacific Ocean <i>Fiona Petchey, Mathew Phelan, Peter White</i> .....	1005
<b>ERRATUM</b> .....	1015
<b>RADIOCARBON UPDATES</b> .....	1017
<b>AUTHOR INDEX</b> .....	1019
<b>SUBJECT INDEX</b> .....	1025

