Radiocarbon in the Environment Conference

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AMS Radiocarbon Dating

Queen’s University Belfast

• results: typically less than 10 weeks
  - fast track available
  - accurate and precise*
  - $^{13}\text{C}$ & $^{15}\text{N}$ included for bones

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* Check our website for VRII results

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Foreword from the Conference Organisers

We are very pleased to welcome you to the Inaugural International Radiocarbon in the Environment Conference 2014, a multi-disciplinary conference in a beautiful setting in Queen’s University Belfast. The conference organisers aided by the Scientific Committee have put together excellent scientific and social programmes that comprise the latest environmental research utilising radiocarbon and other isotopes. We hope that this conference will be the first of many in a series, which will allow researchers to present their environmental research using radiocarbon and stable isotopes. Feel free to speak to conference organisers about hosting the next conference in 2017!

The radiocarbon field of research is multifaceted and we wanted to bring together those using radiocarbon to investigate our present day and past environments. Natural abundance, bomb and enriched radiocarbon, in addition to stable isotopes, have all been used in ecological and environmental investigations.

The papers included at this conference cover many aspects of environmental change from atmospheric and marine global carbon cycles to carbon dynamics in freshwater and in terrestrial soils. We have many papers presenting novel uses of radiocarbon from forensic analysis to the utilisation of sewage in marine food webs! New avenues of research are always appearing and we are delighted to provide a forum for the presentation of new ideas as well as providing opportunities to renew friendships and make new acquaintances.

Many people have worked hard to make this conference a reality and we are grateful to our event management team and all our excellent student volunteers for their invaluable work. We also offer special thanks to our session conveners for their outstanding efforts in reviewing abstracts and chairing sessions that make this conference such an interesting prospect.

We thank the many sponsors (as shown in the programme booklet) that have helped to promote the meeting and support social events such as Belfast City Council and the Lord Mayor of Belfast who have generously provided our civic reception at the stunning City Hall. We are indebted to those at the National Trust who have provided access to and tours of the Giant’s Causeway. We are also grateful to the editors of the Radiocarbon Journal for making it possible to publish the proceedings as open access to increase the impact of the research presented at the conference.

Finally we thank the presenters for sharing their high quality research and ideas. Without their hard work the conference would not be possible. We hope that you will enjoy the scientific and social programmes as well as the wonderful City of Belfast, and the picturesque landscape of Northern Ireland!

Evelyn Keaveney, Paula Reimer, Philippa Ascough, Jesper Olsen
Queen’s University Belfast was originally established as ‘Queen’s College, Belfast’ in 1845, one of three colleges in Ireland at that time. It was raised to the status of a full university in 1908 with its own Charter and Statutes. Queen’s has an excellent academic reputation with over 160 years of heritage and, as a member of the Russell Group of the UK’s leading research-intensive universities, takes pride in offering an exceptional learning experience. The University has won Queen's Anniversary Prizes for Further and Higher Education on five occasions – for world-class achievement in cancer research, green chemistry, environmental research, palaeoecology and law.

The McClay Library, designed by the Boston-based architectural practice Sheply, Bulfinch, Richardson & Abbott, working in association with Belfast architects, Robinson Patterson Partnership, was officially opened in July 2009. Sustainability was a critical factor in the design and construction of the library, in keeping with the University’s environmental policy. The building meets the highest environmental standards. It has 2,000 reader places. Special Collections & Archives at Queen’s University Library comprise the Library’s rare and early printed books, map and manuscript collections, as well as more modern material relating to Ireland, and Ulster in particular. Special Collections & Archives at The McClay Library is open to anyone who wishes to make use of our resources. A visitor pass can be obtained on request from the Conference Registration Desk in the Welcome Centre.

The School of Geography, Archaeology and Palaeoecology (GAP) has an excellent track record of world leading research in environmental processes; critical considerations of human-environment relations from prehistory to the present; and the contemporary geospatial context of scientific understandings. GAP staff investigate and advance knowledge about the physical and cultural world, past and present, focusing upon contemporary relevancy. Our strategy is to address primary, sustainable, research agendas in (i) chronology and the rate of change in environments (past and present, natural and anthropogenic); (ii) mechanisms for cultural change through time and space; and (iii) role of space in knowledge enterprises and socio-political processes with interdisciplinary research projects spanning the globe. GAP encompasses the Centre for Climate, the Environment and Chronology (14CHRONO), the Centre for Archaeological Fieldwork (CAF), the Centre for Data Digitisation and Analysis (CDDA), the Centre for Canadian Studies (CCS).

Our world leading reputation is reflected in the QS World University Rankings, where Geography at QUB is in the world’s top 100. Archaeology (not a QS subject) at QUB is ranked 8th out of 34 UK institutions by the Guardian.
## Summary Programme

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### Venues:
- **Registration and Information Desk** – Queen’s Welcome Centre
- **Plenary Sessions** – Bell Lecture Theatre, Physics Building
- **Parallel Sessions** – Old Staff Common Room
- **Tea / Coffee / Lunch / Poster Session** – The Great Hall
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Conference Activities

Civic Reception
5.30pm – 7pm,
Monday 18 August 2014
Belfast City Hall

We are pleased to invite all conference delegates to attend a reception in Belfast City Hall from 5.30pm on Monday evening. Belfast City Council have kindly provided civic hospitality in the form of a drinks reception and we would like to take this opportunity to thank them for their generosity. The reception will be hosted by the Head of the School of Geography, Archaeology and Palaeoecology in Queen’s University, Professor Audrey Horning.

Conference Tours
Wednesday 20 August 2014
If you have not already purchased your tickets, please check availability at the Conference Registration and Information desk on arrival to the Queen’s Welcome Centre. As the tours run in parallel, you can only attend one of the two tours. Further details on both tours can be found by visiting www.qub.ac.uk/sites/14C/Tours.

Brú na Bóinne (Boyne Valley) Tour
Monasterboice: an early Christian monastery and round tower
Knowth: a Megalithic Passage Tomb
Hilden brewery

North Coast Tour
The Giant’s Causeway and Carrick-a-Rede Rope Bridge

Conference Dinner
Thursday 21 August 2014
The Great Hall, Queen’s University Belfast

Join us for what promises to be a wonderful evening of local hospitality at the Conference Gala Dinner. The evening begins with a drinks reception in the Quadrangle from 7.30pm followed by a superb four course banquet dinner with drinks in the Great Hall itself. If you have not already purchased your tickets, please check availability at the Conference Registration and Information desk in the Welcome Centre.

About Belfast
For further information on all that Queen’s and Belfast has to offer during the conference week, please visit the links below:
www.queensfilmtheatre.com
www.naughtongallery.org
www.visit-belfast.com
Tuesday
10.30 – 11.30

Plenary
Ingeborg Levin
Fifty Years of Bomb-Radiocarbon Application in Environmental Sciences

Coffee

Levin

1. 12.00 – 12.20
   Richard Staff
   A comparison of the Greenland ice-core and Intcal timescales around the timing of the Laschamp geomagnetic excursion utilising new 14C data from Tenaghi Philippon, Greece

2. 12.20 – 12.40
   Heather Graven
   Projections of atmospheric radiocarbon content to 2100

3. 12.40 – 13.00
   Lucas Wacker
   Fast changes in atmospheric radiocarbon concentrations in the past

13.00 – 14.20 Lunch

Atmosphere – Radiocarbon (and stable isotopes) in the urban environment
Hammer & Vogel

4.  14.20 – 14.50
    Jocelyn Turnbull
    The Indianapolis Flux Project (INFLUX): Development and assessment of methods for urban greenhouse gas emission monitoring

5.  14.50 – 15.10
    Samuel Hammer
    14C supported interpretation of long-term atmospheric trace gas records in the Heidelberg urban environment

6. 15.10 – 15.30
    Xiaomei Xu
    Temporal variations in fossil fuel emissions in the Los Angeles megacity

15.30 – 16.00 Coffee

7. 16.00 – 16.20
   Laura E. Beramendi-Orosco
   Temporal and spatial variations of atmospheric radiocarbon in Mexico City

8. 16.20 – 16.40
   Soenke Szidat
   Fossil and non-fossil sources of carbonaceous aerosols at urban and rural sites in Switzerland during winter-smog episodes

17.00 – 18.30 Poster Session
### Wednesday

**Field Trips**

### Thursday

**Techniques – Applications of \(^{14}\)C in Forensic Science**

*Cook*

1. **09.00 – 09.20**  
   Gordon Cook  
   Radiocarbon analysis of modern skeletal remains to determine year of birth and death

2. **09.20 – 09.40**  
   Alastair Ruffell  
   Isotopic Dating and Provenance in Geoforensics

**Marine – Radiocarbon and stable isotopes in marine environments**

*Reimer and Fallon*

3. **09.40 – 10.00**  
   Stuart Fallon  
   Using radiocarbon in coral skeletons to reconstruct seawater pH at Milne Bay, PNG

4. **10.00 – 10.20**  
   Jesper Olsen  
   North Atlantic surface ocean \(^{14}\)C variability between 30 – 40 kyr. BP

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| 11.00 – 11.20 | Yorgos Facorellis  
   Sea surface radiocarbon reservoir age changes in the Aegean Sea from 13,000 cal BP to present  

5. **11.00 – 11.20**  
   Yorgos Facorellis  
   Sea surface radiocarbon reservoir age changes in the Aegean Sea from 13,000 cal BP to present

6. **11.20 – 11.40**  
   Alexander Cherkinsky  
   \(^{14}\)C Variations in pre-bomb near shore habitats of Florida Panhandle, U.S.A.

7. **11.40 – 12.00**  
   Hellen Cristine Santos  
   Marine reservoir correction in North-eastern of Brazil obtained from annually-banded Mussismilia braziliensis coral

8. **12.00 – 12.20**  
   Paula Reimer  
   Contribution of sewage organic matter to the diet of the common limpet near the former outflow at Blackhead, Northern Ireland

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**Marine – Radiocarbon as a tracer for Southern Ocean Exchange**

*Turnbull and Lindsay*

9. **14.00 – 14.20**  
   Jocelyn Turnbull  
   Long-term variability in Southern Hemisphere \(\Delta^{14}\)CO\(_2\) from the Wellington record

10. **14.20 – 14.40**  
    Tianyu Chen  
    Southern Ocean Radiocarbon records from deep-sea corals

11. **14.40 – 15.00**  
    Mr Colin Lindsay  
    Southern Ocean carbon sink constraints from radiocarbon in Drake Passage air

12. **15.00 – 15.20**  
    David Munro  
    Assessing changes in vertical entrainment in the Drake Passage of the southern ocean using observations of radiocarbon and surface CO\(_2\)

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# Programme with titles

Marine - Oceanographic variability using radiocarbon, stable isotopes and other geochemical tracers  
Olsen & Austin  

13. 16.00 – 16.30  
William Austin  
Radiocarbon data from North Atlantic marine sediments directly linked to millennial-scale climate variability through the last glacial period

14. 16.30 – 16.50  
Ann McNicholl  
Radiocarbon in the Canada Basin: Carbon Transfer Processes in the Changing Arctic

15. 16.50 – 17.10  
Laura Reynolds  
Radiocarbon Reservoir Variability in California Estuaries

16. 17.10 – 17.30  
Michael Sarnthein  
Glacial-to-deglacial patterns of change in planktic and benthic reservoir ages: Indicators of oceanographic and carbon cycle variations.

## Thursday Parallel

### Marine – Bomb radiocarbon dating of marine organisms: research and application

Allen Andrews  

1. 9.00 – 9.30  
Allen Andrews  
Bomb radiocarbon dating of marine organisms: research and application

2. 9.30 – 9.50  
Heather Christiansen  
Challenges of using bomb radiocarbon to validate ages of a highly mobile apex predator, the white shark, from the Southern Hemisphere

3. 9.50 – 10.10  
Jesse Farmer  
Transfer of Bomb Radiocarbon to the Intermediate Ocean: Reconstructions from North Atlantic Bamboo Corals

4. 10.10 – 10.30  
Nadine Tisnerat-Laborde  
Bomb radiocarbon chronologies of Lophelia pertusa and Madrepora oculata cold-water corals

10.30 – 11.00  
Coffee

### Freshwater – Carbon routing in freshwater environments

Fernandes & Drevés  

5. 11.00 – 11.30  
Tim Jull  
Towards a better understanding of the variability in radiocarbon reservoir effects within freshwater contexts

6. 11.30 – 11.50  
Ricardo Fernandes  
Carbon in the food web of an alkaline humic lake: a $\Delta^{14}$C, $\delta^{13}$C and $\delta^{15}$N approach

7. 11.50 – 12.10  
Evelyn Keaveney  
Use of radiocarbon natural abundances and compound-specific isotope analyses for stream food web research

8. 12.10 – 12.30  
Natoa F. Ishikawa  
Use of radiocarbon natural abundances and compound-specific isotope analyses for stream food web research

12.30 – 14.00  
Lunch
Techniques - Radiocarbon in environmental monitoring of nuclear facilities  
Molnar, Poveneck & Svetlik  
9. 14.00 – 14.30  
Roland Purtschert  
Monitoring $^{14}$C and $^{37}$Ar in the Environment of Swiss Nuclear Facilities  
10. 14.30 – 14.50  
Pavel Poveneck  
Forty-five years of atmospheric radiocarbon variation studies in Bratislava and at the Bohunice nuclear power plant  
11. 14.50 – 15.10  
Róbert Janovics  
$^{14}$C impact of a near field radioactive waste disposal facility in a nearby tree  
12. 15.10 – 15.30  
Mihály Molnár  
Study of dissolved organic C-$^{14}$ level in the groundwater monitoring network of a radioactive waste disposal facility  

15.30 – 15.50  
Coffee  

Techniques - $^{14}$C and Energy Production: Nuclear fuel to Bio-fuel  
Muir  
13. 15.50 – 16.10  
Graham Muir  
Anomalous $^{14}$C Enrichments in the Eastern UK Coastal Environment  
14. 16.10 – 16.30  
Kieran Tierney  
Accumulation of Sellafield-Derived Radiocarbon ($^{14}$C) in Irish Sea Intertidal Sediments  
15. 16.30 – 16.50  
Sanne W.L. Palstra  
$^{14}$C-based determination of biogenic fractions in fuels and flue gases: methodological uncertainty issues  

Techniques: Radiocarbon and palaeoenvironmental reconstruction in practice  
Patterson, Trainor and Roe  
16. 17.00 – 17.20  
Bettina Stefanini  
Exploring evidence for alternative chronologies and pathways of recycled carbon within an ombrotrophic peat sequence from Ballyduff Bog, Co. Tipperary, Ireland  
17 17.20 – 17.40  
Prabhakaran Ramyabala  
Variations associated with pre-treatment method in radiocarbon age measurement from mineral rich peat, India  

7:30 pm Gala Dinner
**Friday**

**Terrestrial - Radiocarbon applications in natural soils**

Martinsen, Mills & Tipping

1. **09.00 – 09.20**
   Jens Leifeld
   The soil's radiocarbon signature – an indicator for soil carbon dynamics and vulnerability

2. **09.20 – 09.40**
   Tessa van der Voort
   Radiocarbon as a tool to assess organic matter vulnerability across different regions in Swiss soils

3. **09.40 – 10.00**
   Hannah Toberman
   $^{14}$C in British Soils

4. **10.00 – 10.20**
   Edward Tipping
   Long-term organic carbon turnover rates in natural and semi-natural topsoils

5. **10.20 – 10.40**
   Christine Hatté
   Global understanding of vertical soil carbon dynamics: meta-analysis of soil $^{14}$C data.

**10.40 – 11.10** Coffee

**Terrestrial – Radiocarbon and stable isotopes in terrestrial environments**

Ascough

6. **11.10 – 11.40**
   Israel Carmi
   Variations in the isotopic compositions of dissolved inorganic carbon and of moisture in the unsaturated zone of a semi-arid region due to biotic and a-biotic processes

7. **11.40 – 12.00**
   Alexander Cherkinsky
   $^{14}$C content in Chilean Fitzroya cupressoides tree ring 1500-1950 AD

8. **12.00 – 12.20**
   Ichiro Tayasu
   Use of carbon-14 in terrestrial food webs

**12.20 – 14.00** Lunch

**Terrestrial - Dissolved organic carbon, methane and carbon dioxide in soil and aquatic environments**

Bryant, Keaveney and Ascough

9. **14.00 – 14.20**
   Pauline Gulliver
   Extraction and analysis of sub-milligram per litre concentrations of Methane from Groundwater for $^{14}$C analysis

10. **14.20 – 14.40**
    Pauline Gulliver
    $^{14}$C and $^{13}$C signatures of CH$_4$ and CO$_2$ from landfill associated gases in the UK.

11. **14.40 – 15.00**
    Evelyn Keaveney
    Investigating carbon cycling in a complex lake: a novel use of $\Delta^{14}$C

**Coffee**
12. 15.30 – 15.50
Jessica Adams
Estimating Sources and Fluxes of Dissolved and Particulate Organic Matter in UK Rivers

13. 15.50 – 16.10
Leena Vihermaa
Tracing the slow turn-over C cycle in tropical fresh water

14. 16.10 – 16.30
Trent Marwick
The age of river-transported carbon: new data from African catchments and a global perspective.

16.30 – 17.30 Closing Remarks

17.30 Closing Wine Reception
Hosted by: School of Geography, Archaeology and Palaeoecology
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n.ogle@qub.ac.uk / r.doherty@qub.ac.uk
Ph: +44 28 9097 4908

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AMS & Conventional

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\( \delta D, \delta^{13}C, \delta^{15}N, \delta^{18}O, \delta^{34}S, \frac{87Sr}{86Sr}, \)

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Paula Reimer (Queen's University, Belfast)
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Ellen Druffel (University of California – Irvine)
Jesper Olsen (Aarhus University)
Chris Harrod (Queen Mary’s University London)
Chris Brodie (ThermoFisher Scientific, Bremen, Germany)
Ingebore Levin (University of Heidelberg)
Exhibitor contacts

\textbf{\textsuperscript{14}CHRONO Centre for Climate, the Environment and Chronology}
s.hoper@qub.ac.uk
www.chrono.qub.ac.uk

\textbf{National Electrostatic Corporation}
nec@pelletron.com
www.pelletron.com

\textbf{Radiocarbon}
mcclurem@email.arizona.edu
http://radiocarbon.org/

\textbf{Stable Isotope Facility, QUB}
n.ogle@qub.ac.uk
http://www.qub.ac.uk/research-centres/eerc/Facilities/CoreFacilities/StableIsotopeFacility/

\textbf{Thermo Fisher Scientific}
sara.gagliardi@thermoscientific.com
http://www.thermoscientific.com
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www.qub.ac.uk/sites/14C