FROM THE GUEST EDITOR

Reliable, precise, and accurate radiocarbon age measurements are essential. Such measurements also require traceability to international standards' activities which are known exactly by independent means and also to reference materials' activities which are estimated and typically accompanied by associated uncertainty statements. Within the ^{14}C community, there has been an increasing realization of the need for adequate reference materials. Long and Kalin (1990) stressed that it was incumbent upon individual ^{14}C laboratories to engage in a formal program of quality assurance (QA). Polach (1989) noted that the opportunity for internal checking by individual laboratories involved in producing routine ^{14}C measurements was hampered by a lack of suitable quality control (QC) and reference materials.

Since the early days of applied ^{14}C measurement, it has been common practice for laboratories to exchange samples in attempts to improve and sustain analytical confidence. With time, this practice tended to give way gradually to a succession of more formal group intercomparison exercises. Within the ^{14}C community in just under 20 years, there have been a number of significant and very extensive interlaboratory trials organized by individual laboratories and the International Atomic Energy Agency to the benefit of the ^{14}C community, both laboratories and users (Otlet et al. 1980; ISG 1982; Rozanski et al. 1992; Scott et al. 1990, 1992; Gulliksen and Scott 1995; Scott et al. 1998; Bryant et al. 2000; Boaretto et al. 2003).

These comparisons have varied widely in terms of sample type and preparation, but all (with one exception) have had as their primary goal the investigation of the comparability of results produced under possibly quite different laboratory protocols. However, in reaching this goal, a number of these studies have also created reference materials. As methods and instrumentation have developed and new laboratories are formed, the reference materials created as a result of the intercomparisons, have been widely used for checking procedures and performance. Users have been reassured by the existence of regular comparisons that the laboratories are striving to ensure highest quality results while at the same time, the laboratories have been able to identify any systematic offsets and additional sources of variation. Indeed, in studies which have used representative samples requiring pre-treatment, chemical synthesis and counting, it has been possible to identify the procedure at which problems have arisen and to quantify their relative contributions to the overall variation in the results. Thus, participation in a laboratory intercomparison has been seen to be a part of a formal QA program and the resulting reference materials to form a community resource for the benefit of all.

This special issue of *Radiocarbon* brings together, for the first time, all the experimental results and their analysis from the last two major ^{14}C intercomparison exercises (Third International Radiocarbon Intercomparison [TIRI] and Fourth International Radiocarbon Intercomparison [FIRI]).

The impetus for its production has been two-fold, the need for transparency in the work and the dissemination of the results beyond the participating laboratories to a wider community of laboratories and users.

As can be seen from the lists within the issue of participating laboratories, the ^{14}C community has embraced these intercomparisons with a great deal of enthusiasm, and commitment since the experimental effort involved is not inconsiderable and has usually taken place over a relatively short period of time. In the 20 years during which the Glasgow group has been involved in their organization, the participation rate in the intercomparisons has reached over 75% of operational ^{14}C laboratories worldwide and the reference materials now reach all parts of the globe, so truly an

international effort. A suite of reference materials (all natural) and spanning the applied ^{14}C timescale has been created for the benefit of the ^{14}C dating community.

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FOR TIRI:

Professor Mike Baillie, Queen's University of Belfast	wood
Mr Steinar Gulliksen, ^{14}C laboratory, NUST, Trondheim	whalebone and doublespar
Dr Andrew Dugmore and Mr Anthony Newton, Edinburgh University	Icelandic and Hekla Peat
Dr John Thomson, Institute of Oceanographic Sciences	turbidite
Dr Svein Jakobssen, Natural History Museum, Reykjavik	doublespar
Dr Anne Crone, AOC, Edinburgh	Crannog wood
Glengoyne Distillers	barley mash
Ms Ellen Ostvik, Flatanger Council, Norway	whalebone
Dr Kazimiercz Rozanski, IAEA, Vienna	cellulose
Drs Adrian M Hall, Graeme Whittington, Neil J Alexander	Fuglaness wood and Ellanmore peat
Dr R Preece, University of Cambridge	Tufa

FOR FIRI:

Professor Mike Baillie, Queen's University of Belfast	wood
Mr Steinar Gulliksen, ^{14}C laboratory, NUST, Trondheim	mammoth tusks
Dr Kh Arslanov, St Petersburg	mammoth tusks
Dr John Thomson, Institute of Oceanographic Sciences	turbidite
Dr Alan Hogg	Kauri wood
Dr Marco Spurk, Hohenheim	wood
Glengoyne Distillers	barley mash
Dr Ganna Zaitseva, St Petersburg	Dogee Barrow wood, leather
Dr Roy Switsur	wood

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A number of individuals were involved in the development and implementation of the FIRI program, including:

Gordon Cook and Philip Naysmith	SUERC ^{14}C laboratory, East Kilbride
Eddie McGee	^{14}C laboratory, University College Dublin
Israel Carmi and Elisabetta Boaretto	^{14}C laboratory, Weizmann Institute
Steinar Gulliksen	NTNU, Trondheim
Goran Possnert	Tandem accelerator laboratory, Uppsala
Mark van Strydonck	KIK ^{14}C laboratory, Brussels
Hans van der Plicht	^{14}C laboratory, University of Groningen
Jan Heinemeier	AMS laboratory, University of Aarhus
Doug Harkness and Charlotte Bryant	NERC ^{14}C laboratory, East Kilbride
Marian Scott and John McClure	University of Glasgow, Glasgow

FIRI was organized by Marian Scott, Gordon Cook, Doug Harkness, Philip Naysmith, and Charlotte Bryant.

THE FUTURE

Will there be a Fifth International Radiocarbon Intercomparison (VIRI)? The historical progression of ^{14}C laboratory intercomparisons from the Third (TIRI, completed in 1995) and Fourth (FIRI, completed in 2000) suggests that a Fifth (VIRI, completed in ??) should also be expected.

Criticisms of the design of TIRI and FIRI have included the need for the measurements to be made over a relatively short period of time (hence the workload within the laboratory is compromised), the fact that they provide only a snapshot in time and that the samples are not anonymous but that laboratories are. Can we do better?

A new program, VIRI, is being planned to address some of these criticisms while retaining some of the important features of TIRI and FIRI. One proposal being considered is that VIRI becomes a rolling and ongoing program, with a small number of samples being dispatched to participating laboratories each year. However, the frequency, number of samples, and their type within VIRI are still to be finalized after consultation with the community. The Glasgow group is committed to implementation of VIRI, which should commence in 2004.

On a personal note, first TIRI and then FIRI evolved from two earlier intercomparisons which I co-ordinated, and I would like to take this opportunity to thank two people especially who have been instrumental in this work.

Murdoch Baxter, as my doctoral supervisor, first introduced me to the world of ^{14}C dating and to my first experience of laboratory intercomparisons. That first intercomparison (ISG 1982) was small, involving only 20 laboratories, but with their support and help, the program developed. Today, 20 years later, those same 20 laboratories (almost) are still participating.

In the later intercomparisons, one other person played an important role and I would also like to thank Doug Harkness (now enjoying a well-earned retirement in Forfar) for sharing his knowledge of ^{14}C dating with me, and for playing a pivotal role in keeping the program on track.

I much appreciate all the support and trust which the ^{14}C community has placed in me. Without their willingness to participate, the intercomparison program would not be as strong as it is today.

E Marian Scott

Glasgow, July 2003

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