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Radiocarbon

1990

INTERNATIONAL WORKSHOP OF INTERCOMPARISON OF RADIOCARBON LABORATORIES

WELCOME

THE AIMS

THE PROGRAMME[1]

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On behalf of the organising committee, it is a great pleasure to welcome you all to this ^{14}C workshop and indeed to Scotland. The organising committee has already indicated its ability by arranging sunshine for a place and time in which horizontal rain is more common. We plan to build on this initial success by having an outstanding week of good science and pleasant social activity. Scientifically, we have the opportunity firstly to look back and review previous research on the accuracy and precision of ^{14}C dates. Then we will hear and discuss some important new results from the final stage of the present international intercomparison study. Finally, we will discuss and plan mechanisms and procedures by which, in future, we can improve our general level of performance. Paralleling this and of equal if not more importance, we have arranged a social programme which we hope will give us the opportunity to eat and drink well together, see some of the country, get to know each other better and discuss our science informally. So our hopes are high and our welcome sincere.

However, in case everything goes wrong, I want you to know whom to blame. Or, put another way, I would like to introduce you to the other members of the organising committee so that, if you need help with anything - travel, accommodation, money, etc - you know to whom to turn. So let me point out that the meeting, and indeed the international study, which underpins the meeting, have been organised collaboratively among three laboratories here:

1. The person with whom you have had most contact and who has coordinated everything is *Marian Scott* of the University of Glasgow, Department of Statistics. The first international intercomparison study almost a decade ago formed part of Marian's doctoral research. Marian now spends a day or two each week here at East Kilbride, which is about 10 miles from the University of Glasgow or, if Marian is driving, it is about 20 miles away - this being an "in" joke! Marian's doctoral research long ago was co-supervised by *Tom Aitchison* and myself, and, since then, Tom has retained his interest and involvement in ^{14}C quality control and error assessment.

2. On site here in East Kilbride, we have two quite separate radiocarbon dating laboratories. The first (but not necessarily the foremost!) of these is the radiocarbon laboratory of the UK's

[1]The editors concede, this one time, in retaining the 'Briticisms' of Prof Baxter's opening and closing remarks to recapture the atmosphere of the meeting!

Natural Environment Research Council, this lab serving the UK's entire earth sciences' dating research demand. This lab is headed by *Doug Harkness*, ably assisted by *Brian Miller*.

3. The second radiocarbon laboratory belongs to the *Scottish Universities Research and Reactor Centre* (SURRC), of which I am Director, the ^{14}C lab being under the control of *Gordon Cook*. The two ^{14}C labs on site work closely together and scientifically complement each other, Gordon's lab currently having a major remit towards Scottish archaeology and environmental research.

Much better looking and more pleasant to talk to if you wish help are our two conference secretaries, *Margaret Kerr* and *Janet Walker*. They will be 'manning' the registration desk and are here to assist wherever they can.

So that is the organising committee. The other crucial (if a little boring) information which people in my current position have to announce is the list of sponsors of the meeting. It is true to say, however, that, without the help of many organisations, the workshop could not have taken place. Foremost of all our sponsors is the UK *Science and Engineering Research Council* (SERC), which not only has contributed money towards the costs of this workshop but also, more importantly, has entirely funded the international intercomparison study itself. Without SERC, then, we would have little science to discuss here. The UK *Natural Environment Research Council* has also contributed important funds to the meeting, as have the two equipment companies, *Pharmacia* and *Canberra-Packard*, and the *Scottish Development Agency*. The *National Engineering Laboratory* has generously donated these modern and lavish conference facilities and the *East Kilbride Development Corporation* has provided conference folders, paper, pens, information, etc. Finally, we thank, with considerable anticipation, *Glasgow District Council* who, on Wednesday, will provide a Civic Reception and Banquet for us in Glasgow City Chambers.

I wish at this stage to comment a little bit on the science and, first, the history behind this meeting. Why do we have three labs in this small part of western Scotland, each with a keen interest in ^{14}C dating? To find the roots we have to turn the clock back almost 25 years. At that time, Dr Alan Walton, now Director of the IAEA's International Laboratory of Marine Radioactivity in Monaco, arrived at the Chemistry Department, University of Glasgow, to take up a Lectureship in Nuclear Geochemistry. Alan had previously been involved in radiocarbon measurements at the National Physical Laboratory in England and at both Lamont-Doherty and Isotopes Incorporated in the States. He immediately began ^{14}C studies at Glasgow, built two laboratories and Doug Harkness and myself were his first two research students. When Doug completed his doctoral research, he moved out here to East Kilbride and set up the new NERC ^{14}C dating laboratory which has been outstandingly delivering the goods ever since. After a postdoc period in USA, I took over Alan Walton's post at the University of Glasgow, Alan moving on to Canada. My group in Glasgow generated a whole series of research students and assistants, including Mike Stenhouse, who later worked with Hans Suess at La Jolla, and John Farmer, who had a spell at Woods Hole Oceanographic Institution. The series of Glasgow students culminated in Marian Scott and in our major interest in analytical variability. But, in fact, the interest in errors began with the research student immediately preceding Marian, a fine chap called John Campbell. One part of John's research was to analyse 24 replicate samples of homogenised old wood. While his typical one-sigma statistical error, from counting alone, was around 40 years, his replicate error was about twice this value. John then spent a lot of time looking unsuccessfully for sources of this extra variability. Many of us have since attempted the same task. It is not obvious that we have progressed greatly. Anyway, with replicate errors mysteriously twice those that we could identify and quantify, we began, with Marian's doctoral research, to assess how typical of the performance of the international ^{14}C community this local problem might be. If it was indeed a common problem, could we together try to identify the causes and together try to reduce the errors? - a kind

of international self-help programme. Well, as you know, the first international intercomparison study published in *Nature* many years ago showed that, as a group, John Campbell's original problems were quite generally shared around the world. On average, we would have to multiply typical quoted errors on ^{14}C dates by 2 or 3 to produce a real measure of observed uncertainty. This is a crucial matter both to labs themselves and to the users of ^{14}C dates. It must be resolved and we must resolve it together. In many ways, that is the sole reason for this workshop.

So, towards these aims, we have recently organised a second, much larger and slightly more sophisticated intercomparison exercise involving selected natural samples of different ages, analysed 'blind'. Many of the workshop delegates here have participated. This week, then, we will review the current state of health of the international ^{14}C dating community with regard to the accuracy and precision of its product.

The aims of the meeting coincide with those of the intercomparison programme. In the closing session on Friday, I will review these aims again to assess whether we have met any of them during the course of the workshop. The aims are expressed as questions needing answers, as follows:

1. How does ^{14}C variability compare at each stage of the laboratory analysis?
2. Are there lab offsets and biases? If so, what are they?
3. Are there performance differences between lab types, *ie*, between liquid scintillation, gas counting, accelerator mass spectrometry labs?
4. Does sample type influence performance?
5. Do quoted errors account for the observed variability?
6. If there is excess variability, can the results help to identify the cause?
7. Is there an indicated need for a future intercalibration programme?
8. If so, what are the requirements and what is the mechanism?

We will work towards these very fundamental questions via a structured scientific programme interspersed with outings and feasts! Today we will review the past data set and come up to present on the new results from the current intercomparison programme. These new results will, I think, prove to be of major importance. Overseas participants will tell us of their experiences and conclusions from the study. In the evening, we will dine in the Burrell Gallery, the site of one of the most important private art collections in UK and a most pleasant venue for an evening together. Tomorrow, the subject widens to encompass general views of the ^{14}C community on quality assurance and we begin to look to the future. We must plan together to improve our performance. Delegates from IAEA will outline suggestions for enhanced availability of intercalibration and reference materials. Marian Scott will propose the lesson from the two Scottish studies. In the evening, the city of Glasgow will provide a reception and banquet, with entertainments, in the grand, Victorian, City Chambers. It should be a night to remember! The Thursday and Friday sessions are almost entirely devoted to discussions on, and planning for, the future. There will, however, be a technical session in which new techniques in liquid scintillation counting will be described. On Thursday, we will lunch in the dungeons of a Scottish castle, visit the historically important Stirling Castle and move on to the highlight of the week, a visit to a malt whisky distillery where the water of life is lovingly made. From there, we will have drinks in the University of Glasgow's Hunterian Art Gallery and move on to the conference dinner in the University's dining halls. On Friday, we close the meeting with a summary review session. Thereafter, there will be ample opportunity to visit our laboratories.

That then is a summary of the programme. It deserves to succeed. Because everyone here is investing, and has invested, effort, time and money on the single objective of trying to improve the quality of a typical ^{14}C date. This is a motive which simply merits success. I therefore repeat my warm welcome to you and declare the workshop open.