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THE INTERNATIONAL RADIOCARBON DATA BASE: A PROGRESS REPORT

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ABSTRACT. An International Radiocarbon Data Base (IRDB), an online centralized ^{14}C data management and retrieval system has been designed and established to compile, edit and disseminate data to researchers in many scientific fields. The need for such a research tool has been apparent for some years. Since 1985, planning conferences and workshops have addressed the issues of implementing the IRDB. Workshops in Groningen and, most recently in New Haven, have led to consensus on a microcomputer-driven catalogue-type data retrieval management system, selection of an American Advisory Board and the initiation of two pilot projects. A permanent home has been found for the data base at The University of Arizona. It is hoped that our efforts toward international cooperation will culminate with the official launching of this much needed, long overdue enterprise.

INTRODUCTION

The International Radiocarbon Data Base (IRDB) was proposed (Kra, 1986) at the 12th International Radiocarbon Conference in Trondheim, Norway, where goals were set and an International Commission was selected (Table 1). A second international workshop at the Second Archaeology and ^{14}C Conference in Groningen in 1987 (Walker & Kra, 1988) led to the adoption of a microcomputer-driven, catalogue-type data management system using a minimum data entry format. A two-day seminar in New Haven in March, 1988 (Kra, 1988a) addressed such issues as a home for the IRDB, the formation of an American Advisory Board and the selection of two pilot projects. Follow-up meetings and poster sessions are serving to publicize the IRDB and broaden the range of contributors of information and funding sources.

The need for such a research tool has been apparent for some years (Kra, 1988b). Remarkable advances in dating technology, such as Accelerator Mass Spectrometry (AMS), coupled with the availability of extended dendrochronologic time scales have resulted in a burgeoning mass of state-of-the-art scientific data. The IRDB was founded to correct the imbalance between the increasing volume of ^{14}C determinations and diminishing publication and dissemination of results as well as to serve as the quintessential repository for ^{14}C data.

It is hoped that our efforts toward international cooperation will culminate at the Data Base Workshop (see Kra, 1989) with the official launching of this much needed, long overdue project.

TABLE 1

International Radiocarbon Data Base Commission

Renee Kra	Director
RE Taylor	USA
Roger McNeely	Canada
RL Otlet & AJ Walker	UK
Jacques Evin	France
Bernd Kromer	West Germany
WG Mook	The Netherlands
Steinar Gulliksen	Norway
Bogomil Obelić	Yugoslavia
JC Vogel	Africa
HA Polach	Australia
Arie Boomert, BF Morse*	The Caribbean
A Zucchi & O Ortiz-Troncoso	South America
Gilberto Calderoni*	Italy
JF Garcia Martinez*	Spain
Yannis Maniatis*	Greece
André Gob*	Belgium
Martin Manning*	New Zealand
Kunio Omoto*	Japan

*New members

FORMAT

Our first efforts in designing the structure for data entry led to the proposal for a comprehensive, high-level format consisting of 29 fields and massive mainframe storage requirements (Walker & Kra, 1988). Careful and practical redefinition of the project made us realize that this format would prove unwieldy in terms of potential cooperation with suppliers of data and prohibitive costs for storage and operation.

A new, catalogue-type minimum structure (Table 2), consisting of 13 fields was, therefore, adopted to serve as a global directory or index of ^{14}C determinations (Walker & Kra, 1988). Slight refinements (Kra, in press) in the format since the Groningen Workshop have added Comments and Submitter fields. The References field will be relational, with unlimited characters, in a memo or text field. The short form was unanimously accepted in Groningen and New Haven because of the ease with which data may be entered and stored, the potential for maximum cooperation amongst contributors, less misuse and more privacy of information, and the elimination of the need for mainframe storage and compulsory costs that would ensue.

TABLE 2

Structure of the minimum format

1. Lab code	7. Lat, Long
2. Sample name	8. Site
3. ^{14}C determination (±)	9. Submitter
4. ^{13}C value	10. Discipline
5. Sample material	11. Association
6. Country	12. References
13. Comments	

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The mini-structure, perfectly suitable for the microcomputer (or PC), does not preclude the existence of more elaborate and comprehensive laboratory or regional data bases that can be styled to particular needs. Nor should the mini-format be equated with minimum data requirements from the laboratories. On the contrary, submitters must *still* be encouraged to provide as much information as possible for each sample, so that the laboratory can maintain a comprehensive data base of its own for use in future research. Many such repositories already exist, eg, for Africa (Vogel, pers commun, 1987), Belgium (Gob, pers commun, 1988), Egypt (Haas, pers commun, 1988), France (Evin, pers commun, 1987), Japan (Omoto, 1989), the Netherlands (Engelsman, Mook & Taaijke, 1987), Norway (Gulliksen, 1983), the Southern Levant (Weinstein, 1984), the United Kingdom (Walker *et al,* 1989, in press) and Yugoslavia (Obelić, 1989) for the Old World. Austin Long and Robert Kalin (1989) maintain a data base for the Arizona lab, Roger McNeely has established a data base for all of Canada, Erv Taylor maintains ca 40,000 American dates (all pers commun, 1988), to name but a few for the New World. These more complex regional data bases can easily merge with the minimal requirements of the IRDB format. Options also exist for collaboration with data bases in other disciplines, such as the one being established at the Geophysical Data Center of the National Oceanographic and Atmospheric Administration (NOAA) in Boulder, Colorado (David Hastings, pers commun, 1988, 1989).

One of the most important breakthroughs that resulted from discussions with computer experts at our recent workshop in New Haven (eg, David Hastings, Steven LeBlanc, pers commun, 1988), was that the format would be highly flexible, adaptable and convertible. With the availability of multiple software programs and hardware capabilities, rigid formatting and locked-in systems are no longer prerequisites for successful operation. The new key objectives describing the IRDB will be open-ended, multi-user, interactive, diversified, interdisciplinary and relational. The new options that will ultimately be built into the program will include conversion of geographic coordinates to UTM or other national systems, such as National Grid Reference used in the UK, as well as automatic calibration of calendric dates (Stuiver & Reimer, 1986).

Software will be optional as long as it is ASCII convertible and hardware is IBM compatible. For example, dBASE III, III PLUS, or IV can easily be converted to other software programs, such as Q & A, currently in use at the University of Arizona (Kalin & Long, 1989).

For transmitting data to different stations, a network of interactive micro-computers will telecommunicate through BITNET, eg, or through more conventional methods, such as mailing floppy disks or hard copy (printouts).

THE FIRST AMERICAN IRDB WORKSHOP

Because of its great success and long-term possibilities, I would like to report on the First American IRDB Workshop that was held March 25–26, 1988 in New Haven (Kra, 1988a). The primary goals of the Workshop were:

TABLE 3

The American Advisory Board of the IRDB

Executive Director	Renee Kra
Finance Committee	Curt Beck
	Harold Borns
	Frank Hole
	Andrew Moore
Computer Committee	Philip Chase
	Stuart Fleming
	David Hastings
	Robert Kalin
	Pat Kirch
	Steven LeBlanc
	Roger McNeely
	David Steinke
Scientific Coordinating Committee	Liam Kieser
	Austin Long
	Erv Taylor
	John S Vogel

1) to find a home for the IRDB; 2) to launch a fund-raising campaign; 3) to form an American Advisory Board; 4) to select two pilot projects. All of the major objectives were achieved, and many pertinent issues and ideas were discussed and developed.

An American Advisory Board, made up of individuals representing the entire Western Hemisphere (*ie,* North America, Mesoamerica, the Caribbean and South America), consists in the Executive Director and Finance, Computer and Scientific Coordinating Committees (Table 3).

The rationale behind the selection of two pilot projects was to "test the waters," and to activate significant, inclusive data sets for which much organized information already exists. The expertise of the project coordinators will play a crucial role in discovering, uncovering or recovering information that is unpublished, diffused, fragmented or, up till now, largely inaccessible. Original research is also being planned for both projects that will involve field studies and ^{14}C dating of fresh samples, thus ensuring quality control of new data.

Project 1. New World Quaternary Vertebrate Localities

The title of this project warrants explanation. Many of the alleged pre-Clovis sites are also vertebrate localities that have been ^{14}C dated. Archaeologic, geologic, climatic and paleontologic records are preserved at such sites, satisfying the interdisciplinary requirements of the project. A temporal limit older than 8000 BP was set, which has several advantages: it reduces the data to a manageable size, it is older than the calibration tables, thus reducing some work, and it is younger than, thus containing evidence for, most megafaunal extinctions (Richard Morlan, pers commun, 1988).

Project 2. Paleoenvironment and Human History in the Southeast Mediterranean

This study will comprise data from the Southern Levant and Egypt, an area for which much data and many problems exist. The task forces for Projects 1 and 2 are shown in Table 4. James Weinstein (1984) has previously published, in *Radiocarbon,* a significant index of ^{14}C data for the Southern Levant, which should serve as a model for future indexes produced from the Data Base.

TABLE 4

The pilot projects

1. New World Quaternary Vertebrate Localities	George Frison, Director Roger McNeely Richard Morlan Michael Moseley Kim Smiley John Speth
2. Paleoenvironment and Human History in the Southeast Mediterranean	James Weinstein, Director Hendrik Bruins Herbert Haas Fekri Hassan Roy Switsur

The Global Project

It is important to note here that work on the all-inclusive global data base will continue simultaneously with the special projects. Data from every area of the world will be entered and stored for future investigation and indexing. Not only will database workers find it necessary to become sleuth hounds, uncovering clues buried in private papers of deceased collectors and the like, but they will also be responsible for maintaining high scientific standards. The brevity of the format, which will encourage the researcher to undertake more in-depth inquiries, the Comments field, which may note problems or unusual circumstances, and the all-inclusive, relational References field, are essential for quality control. Thus, by assigning individuals with expert knowledge of each topic, we will be ensuring high-precision results.

Proprietary Rights

Yet another issue that worries consumers of ^{14}C data is the notion of proprietary rights *versus* freedom of information, a matter involving commercial laboratories and the purchase of measurements. In order to circumvent this problem, and to deal with the situation fairly, we have set a maximum time limit of five years before compulsory data publication. If the submitter of a sample has not published his/her findings by the end of this period, the data should "go public" and appear in the larger ^{14}C record. Inevitably, discussions on this matter are ongoing.

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Germane to every aspect of the database project are support and encouragement from ^{14}C laboratories, archaeologists, earth scientists, scientific organizations, universities, research facilities, museums, federal agencies and even funding agencies, themselves. It is the responsibility of both producers and consumers of ^{14}C data to publicize, utilize and contribute to the IRDB.

FUNDING

A grant from the Wenner-Gren Foundation made the American Workshop possible and continuation of this funding may be forthcoming in the near future. Several other funding agencies are presently being explored, both federal and private, to support initial start-up costs.

There have been many suggestions to cover ongoing operating costs:

1) a surcharge in the range of $5.00 for every sample submitted for ^{14}C dating; 2) a "library" search charge for each inquiry in the range of $10.00 plus extras; 3) incentives such as "publication credit" to a laboratory or individual, or free access to the data base in exchange for contributions of data (E Mott Davis, pers commun, 1988); 4) a subscription rate to be charged after all the dates have been entered.

Setup costs should be no more than $15,000 and small grants for salaries should help us get started. This would constitute the first phase of the project. After we have established credibility and have matured into a second stage, we should then begin to plan for deriving permanent income from an endowment.

PUBLICITY

The major portion of both funding and data collection will come only *after* we have invested time and energy in a large-scale advertising campaign. The point was made at the New Haven Workshop that we have to *have* a data base in order to *get* a data base. Publication of my article in *American Antiquity* (Kra, 1988b), the New Haven Workshop (Kra, 1988c) and posters at several meetings have generated an incredible amount of cooperation and exchange of information. For example, David Hastings (pers commun, 1988) is setting up trial data sets on CD-ROM for Canada (McNeely, pers commun, 1988), Alaska (Galloway, pers commun, 1988), and Central America (Hoopes, pers commun, 1988). Reid Bryson (pers commun, 1988) of the University of Wisconsin-Madison will provide a data set on volcanic eruptions that he collected from *RADIOCARBON*. Many similar endeavors are being set into motion. The value of publicity of the IRDB is immeasurable. The more visibility and exposure that this project gets, the more successful it will be.

RADIOCARBON AND THE IRDB

^{14}C laboratories and *RADIOCARBON* are the foremost supporters and contributors to the project. The Data Base and *RADIOCARBON* are separate entities and although general opinion favors this arrangement, it also deems their symbiotic relationship crucial to mutual success. The Data Base will eventually replace the date-list function of the journal which will shift its focus to more generalized and technical scientific reporting, a trend it has been following for some years (Kra, 1988b). The journal will also be able to generate more intensive, interpretive research derived from specific data sets provided by the Data Base. In turn, the Data Base will derive much of its fundamental material from back issues and laboratory associations of the journal and its editors.

There have been many changes in the organization and management of the journal in recent months. Minze Stuiver, *RADIOCARBON*'s dedicated and respected Senior Editor for 12 years, has resigned from his duties with the journal. The Governing Committee, Editors, and Associate Editors of the *American Journal of Science, RADIOCARBON*'s parent journal at Yale University, have selected Austin Long as its new Senior Editor and the Geosciences Department of the University of Arizona as its new base of operations. The IRDB is now at the same location. The establishment of the Data Base at a permanent home with an international network of coordinators will furnish its stability and ensure its solid foundation.

CONCLUDING REMARKS

The International Radiocarbon Data Base is a reality. We are on the brink of an exciting new enterprise that should prove revolutionary in scope and utility. The primary goal of the Data Base is to serve as global archive and research tool for a multidisciplinary academic community. It is for this community to support it as much by using it as by contributing to it.

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REFERENCES

Engelsman, FMR, Mook WG and Taaijke, E, in press, Operation of the Groningen ^{14}C data base, *in* Internatl symposium, Archaeology and ^{14}C, 2nd: PACT.

Gulliksen, S, 1983, Radiocarbon database: A pilot project, *in* Stuiver, M and Kra, RS, eds, Internatl ^{14}C conf, 11th, Proc: Radiocarbon, v 25, no. 2, p 661–666.

Kalin, RM and Long, A, 1989, Radiocarbon data base: Q & A – An artificial intelligence database file management program: Radiocarbon, v 31, no. 1, p 1–6.

Kra, R, 1986, Report of the ^{14}C data base workshop, in Stuiver, M and Kra, RS, eds, Internatl ^{14}C conf, 12th, Proc: Radiocarbon, v 28, no. 2A, p 800–802.

———— 1988a, The first American Workshop on the International Radiocarbon Data Base: Radiocarbon, v 30, no. 2, p 259–260.

———— 1988b, Updating the past: The establishment of the International Radiocarbon Data Base: Am Antiquity, v 53, no. 1, p 118–125.

———— 1989, Report of the International Radiocarbon Data Base Workshop: Radiocarbon, this issue.

————in press, Establishing the International Radiocarbon Data Base, *in* International symposium, Archaeology and ^{14}C, 2nd: PACT.

Obelić, B, 1989, The Radiocarbon Data Base at Rudjer Bošković Institute Radiocarbon Laboratory: Radiocarbon, this issue.

Omoto, K, 1989, The Radiocarbon Data Base of Japan: Radiocarbon, this issue.

Stuiver, M and Reimer, PJ, 1986, A computer program for radiocarbon age calibration, *in* Stuiver, M and Kra, RS, eds, Internatl ^{14}C conf, 12th, Proc: Radiocarbon, v 28, no. 2B, p 1022–1030.

Walker, AJ, Charlesworth, SA, Otlet, RL and Lavell, C, in press, Setting up the CBA Index of UK radiocarbon dates as a micro-computer database, *in* Internatl symposium, Archaelogy and ^{14}C, 2nd, Proc: PACT.

Walker, AJ and Kra, R, 1988, Report on the International Radiocarbon Data Base (IRDB) Workshop, Archaeology and ^{14}C conference, Groningen, The Netherlands: Radiocarbon, v 30, no. 2, p 255–258.

Walker, AJ, Otlet, RL, Housley, RA and van der Plicht, J, 1989, Operation of the Harwell UK ^{14}C data base and its expansion through data exchange with other laboratories: Radiocarbon, this issue.

Weinstein, J, 1984, Radiocarbon dating in the Southern Levant: Radiocarbon, v 26, no. 3, p 297–366.

V. WORKSHOPS AND REPORTS

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