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The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

THE UNIVERSITY OF BIRMINGHAM



*With the Compliments
of
Professor J. G. Hawkes*

DEPARTMENT OF BOTANY,
THE UNIVERSITY,
BIRMINGHAM, 15.

WORKSHOP ON INFORMATION SYSTEMS
FOR WORLD GENETIC RESOURCES

Birmingham, England

4th - 5th July, 1972

I. INTRODUCTION

The conservation of genetic resources for present and future plant breeding needs is becoming increasingly important, as old land races and primitive forms are replaced by advanced selections and highly bred cultivars. Yet conservation by itself is not enough.

Evaluation of stored material is essential if it is to be used adequately by breeders. Already, very large quantities, perhaps several million samples, are stored in the world's gene banks, and at least as much again still remains to be collected. The recording and manipulation of relevant data from these collections for plant breeders presents a major information problem.

This problem will increase as the collections become larger and their proper evaluation is carried out. Clearly, the only method of handling such quantities of data is by computerised information storage and retrieval. Special systems are needed to make sure that the information is handled in the correct way, with sufficient flexibility to deal with new types of information and new ways of manipulating it in the future.

The Unit of Crop Ecology and Genetic Resources in the Division of Plant Production and Protection at FAO Headquarters in Rome has already carried out valuable basic studies and has held meetings to discuss this problem.

The matter was also discussed at a meeting entitled 'European and Regional Gene Banks', held at Izmir in April 1972. This Conference was arranged by the gene banks committee and the section 'Wild Species and Primitive Forms' of EUCARPIA (European Association for Research in Plant Breeding) together with the Agricultural Research and Introduction Station at Izmir, and was attended by breeders, geneticists and specialists in various aspects of genetic resources management.

Matters concerning documentation as well as information storage and retrieval when applied to genetic resources data were discussed fully at Izmir.

(continued ...)

Even so, it was felt that it would be of considerable value to arrange a further meeting on Information Systems for world genetic resources, since a number of gene banks, especially the Italian bank at Bari and the German one at Braunschweig-Völkenrode were anxious to establish a single, generally agreed on system for the European collections.

It was hoped to arrange a discussion group or workshop at FAO Headquarters in Rome, but this proved in the event to be impossible through lack of support funds. Consequently the venue was arranged at Birmingham, England, where it was possible to ensure that a reasonable number of gene bank specialists and computer scientists would be able to attend without the provision of special funding. The basis of the Workshop was to provide facilities for those concerned with the storage and retrieval of genetic resources data to discuss information problems with systems managers and computer scientists. Fortunately, Dr. David Rogers of Boulder, University of Colorado, creator of the TAXIR system, was able to attend. Invitations were also sent to Miss Harriet Meadow (Systems Development Manager) and Dr. Stan Shetler (Program Director) of the Flora North America Project, but they were unable to take part through lack of funds. The Workshop was particularly fortunate in being able to include the Director and two of the Staff of the Birmingham University Computer Centre, who kindly evaluated the computer aspects of the systems discussed.

The Workshop was relatively small, as such meetings should be. It comprised 24 members, of whom most were from UK, though scientists from FAO, Italy, West Germany, Sweden, Australia and the USA were also present.

After discussions lasting for two days a series of recommendations was set out on the conclusions reached at the meeting. The present document attempts to summarise these discussions and to present the recommendations.

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III. DISCUSSIONS

The discussions were divided into four sessions, as follows:

a. The Needs

The kinds of data, the format in which they should be set out and the way in which they should be handled to provide the information required by breeders.

b. The Systems

A discussion of available systems, mainly TAXIR, and their structure and function.

c. The Answers

The integration of needs with available systems, and the suitability of such systems for genetic resources data handling.

d. The Conclusions

A summing up of discussions held during the Workshop, with decisions and recommendations.

*Now at Taximetries Laboratory, Department of Biology, University of Colorado, Boulder, Colorado 80302, U.S.A.

a. The first session included a discussion by the German and Italian gene bank representatives and others of the ways in which data should be formatted in order to provide universally agreed systems of documentation. It largely repeated the discussions at Izmir but was necessary at this stage in order to give the computer scientists a clear idea of the type of information to be handled. It was made clear that although much of the basic collecting data was similar for all crops, specific descriptors for each crop were necessary. Not only morphological, but physiological and biochemical descriptors, as well as ones describing disease and pest resistance and adaptation to climate and soil would also be needed, when comprehensive evaluation data became available. It was stressed by one speaker that there were already $2\frac{1}{2}$ million samples in existing gene banks and these might well be increased to 3 million, or even more, in the future. Not only would the major food crops be involved here, but the same systems should be flexible enough to include data on forest genetic resources and the materials in gene banks of wild species, even perhaps the dried collections in the major herbaria.

All participants stressed the need for simplicity on the one hand and flexibility on the other, as being an essential aspect of whatever system might be ultimately adopted. A system must be able to deal with requests for complex combinations of questions, and be equally at home in all the major world languages. Above all, it should be able to provide information rapidly and be easily updated, with provision for new sets of data whenever necessary and efficient feed-back.

b. The discussion of usable systems chiefly centred round a discussion of Dr. Rogers's TAXIR and its possible utility as a universally agreed system. No problems should arise with the need to use different computers, and it was stressed that as near a natural language as possible should be used. It was agreed that TAXIR seemed to be of sufficient flexibility to relate it to present and future needs. The system was not for sale or rent but could be used by anyone with the necessary training, since it was developed on public funds, not by a commercial enterprise. It was stressed that at least one person in each country or region should be well trained in the use of TAXIR so as to act as a centre point for further use in the country concerned. Other systems such as the IBM General Information System and Envir, which was the latest version of TAXIR, used by N.A.S.A., were also mentioned.

c. An initial version of TAXIR had been used in Bari for artichoke and wheat data, using 150 accessions of the former and 1500 of the latter. The Italian gene bank specialists were well satisfied with the results. Further, a conversion of TAXIR for the Siemens machine in West Germany was now ready and would be tried out shortly. Work on Pisum genetic resources data, using the FAO/IAEA system, somewhat modified, had been successfully carried out at Norwich, England.

It was stressed by a number of participants that machine-readable data in whatever format could be converted to TAXIR or indeed any other system. However, there would be considerable advantage in providing data in a standard format for European breeders which might be adopted in other countries in due course.

A discussion followed on the logistics of information storage on a world scale, as to whether information should be held in gene banks or in central data storage points. On the whole it was felt that the data should be held at gene banks but there was no clear conclusion as to whether a systems expert should be allocated to each gene bank or to each country or region. By and large it was thought advisable for a TAXIR specialist to be available in each country, perhaps in a national centre, which might well coincide with the gene bank itself. However, it would be completely unrealistic to imagine that every country could dispose of its own gene bank and information specialist. Rather, along the lines of the recent recommendations to the Consultative Group via the Technical Advisory Committee, a world network of 8 or 9 regional centres would probably be all that could be expected so far as gene banks and their information systems specialists were concerned.

Finally, although it was agreed by the computer scientists that the TAXIR system seemed to meet very well the requirements for genetic resources information storage and retrieval, only an actual test would provide final proof of its acceptability. Hence it was agreed to run a pilot project with potatoes and data from the seed storage laboratory at Fort Collins, Colorado and report to the FAO/IBP meeting at Rome in March 1973.

d. The final recommendations of the Workshop are set out as follows:

1. Data recording systems for genetic resources centres have been established with content and breadth of coverage sufficient to begin work at gene banks. Methods of recording vary from crop to crop and from country to country but members of this Workshop agree that a minimal set of standards is required. The present Workshop calls for the early adoption of a standardised system to record genetic resources data.

ii. Several computer programming systems are already established for gene bank work in various developed countries, each system with some merit for a specialised purpose. This Workshop concurs that these programs should not be abandoned because of the large cost in time and money already expended, and because they serve as partial answers to overall needs in the processing of gene bank data.

The Workshop concludes that there is no real problem associated with transferring data processed by the various extant programs because data can be readily transferred between different computing systems by means of suitable conversion programs.

iii. The concepts of a network of national, regional and global gene banks and information retrieval systems are already established even though such a network has not yet been formally created. The lack of established information retrieval systems is due to insufficient funds to employ trained information management specialists, systems analysts and programmers, as well as to lack of computer facilities.

There is also a need for a suitably flexible and interactive computer programming system capable of working the necessarily complex and numerous data generated at gene banks.

iv. Members of the Workshop agreed that TAXIR (Taxonomic Information Retrieval) offers an opportunity to fill the needs of gene bank information retrieval. There are probably other suitable information retrieval systems but there was general agreement that none had been so thoroughly tested in the precise problems of gene banks as the TAXIR system.

However, Members of the Workshop did not wish to make a permanent commitment to TAXIR since this might interfere with the adoption of an alternative system at a later date.

- v. The cost/effectiveness of TAXIR should be assessed by a pilot study in depth on a particular gene bank problem. This study should be designed to assess the usefulness of TAXIR to the proposed international gene bank network, and should relate to a widespread and diverse crop of world importance, such as the potato.

J. G. Hawkes
Birmingham,
England,
February 1973

26th February 1973
JGH/DMW

Outline of presentation at Birmingham

Information systems do not start all in order
a host of various requirements already established

Workshop
July 3, 1972

A hierarchy of info needs -

use example of a gene bank as an operation -

non-crop specific - explorers -

crop specific -

Types of data -

Qualitative + quantitative

Alpha numeric + purely numeric -

Biologic data most complex -

The biologists who generate it are even more
complex - a thesaurus is a guide - but must be
selective -

A total system approach

1. Incorporate the design of work flow
from initial design through final use of
the material -

2- This requires a computing system of
same complexity - and particularly
flexibility -

A system has to have many components -
i.e. specific enquiries -

general listings -

storage of data in compact form

There are several general systems -

Most deal with bibliographic library -
work

Many listing + ordering programs

The acceptance of one vs the other is
a matter of systematic development
and choice by benchmark tests

Dr. Porceddu - use of TAXIP in Bari -
appld to articles - + summary -

Dr. Brian Sneed - a system for peas -
used FAO ----- recommendations -
Accession data, plus - additional descriptors -
Fixed Field - # IBM 1130.

~~Chuck~~
~~NY 12 + 13~~
~~Wash 14?~~
~~Mary Smith~~
~~Larry Corlidge off.~~



GULF UNIVERSITIES RESEARCH CONSORTIUM

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Policy Statement on TAXIR Availability
This is a rough draft of a letter sent to Jack Hawkes, Otto Franke
and Jorge Leon, in August, 1972

Dear Frank (or whomever)

The following statement indicates
I write to clarify some issues about the availability and restrictions
on the computing system, TAXIR. I want to be certain that there are no fundamental
misunderstandings. She more/ideas for

First, an historical account, to give some perspective. /TAXIR ~~xxx~~ were
~~initially~~ conceived over a period of a few years, starting ~~the~~ in the early
1960's in New York, and later, in Colorado. I received a grant from the
National Science Foundation in 1967, for a period of two years, during which
time the major ideas were brought together, and the ~~early~~ ^{initial} version of TAXIR
established. By 1970, the funds from the National Science Foundation were
expended, and we were no longer funded from Federal ~~or~~ other governmental
agencies
~~xxxxx~~/to continue the development of the information retrieval system. ~~xx~~
~~xxxxxxxxxx~~ The team of biologists, programmers and mathematician who had
developed the ~~xxxx~~ initial version of TAXIR was disbanded, while some of
my staff members turned to other projects where we did have funding. We
were barely able to keep the information retrieval system alive, except the
individuals in the former team, who took the system as we had it, with them.
Some of them have developed the system further, and I have no controll over
their developments or applications, nor can there be any possible conflict
of interest, nor claims that ~~the systems that~~ ^{they now possess} these individuals ^{now possess} must give
the system to anyone because it is in the public domain. This is true because
any developments made by the individuals were not funded by any public money
and are, therefore, at the discretion of the individual to apply or withhold
~~xxxxxxxxxxxxxxxxxxxx~~ ^{he} as ~~they~~ ^{he} see fit. I do keep a copy of the initial
version of TAXIR, but since I am not funded for this purpose, I cannot
give the ~~xx~~ program away, unless someone is willing to enter into a contract
~~xxxxxxxxxxxxxxxxxxxx~~ to pay the costs of getting the program out of storage, and
either running off a list of the program, or provide a tape.

We were fortunate that two of my former staff, who were no longer financed
by my funds, were able to get employment with the Gulf Universities Research
Consortium, which had a ~~x~~ contract from the Mississippi Test Facility ^{of NASA} to

take over the initial versions of TAXIR, and build it into a more efficient operating system under the acronym ENVIR. ~~Workoverxwork~~ This version is greatly modified from the initial ~~version~~ TAXIR, and does not fall under my jurisdiction, but is under the direction of the Gulf Universities Consortium. Since I worked for a few months as project coordinator for the development of portions of ENVIR (amongst several other important programs) I am familiar with that development, but again, am not in charge. This version is properly in the domain of all the 21 universities that make up the Consortium.

It is clear that I have a continuing interest in the development of TAXIR as a tool for the work of ^{appropriate scientific disciplines and organi-} ~~the genetic conservation centres~~ ^{zations}. To accomplish this, I have a small working group, again not funded for purposes of TAXIR, but which keeps up with any developments we can, and to which we add our own updated versions when possible. None of this is under government sponsorship and is, therefore, not in the public domain.

~~Lest it appear that the above statements are in contradiction to my often stated position, let me assure you that this is not the case.~~ I, as a scientist, am greatly concerned that my products ~~are~~ be put to use in the cause of scientific advancement, and to that end, I make my version available to anyone with whom there is a chance to work effectively. ~~I have indicated this to the assembled members of the Workshop on Information Systems for Genetic Resources, held at the University of Birmingham, July 3 and 4, 1972.~~ I am deeply concerned, however, that the system be appropriately applied, and to that end, ask that users receive ~~intensive~~ training in the properx application of a large and complex system. Since I am not funded to provide such training, it is my hope to enter into contract with those who would use the system, or that the prospective user enter into a similar contract with the Gulf Universities Research Consortium where it is possible to achieve ^{similar} ~~the same~~ ends. *This arrangement clearly does not apply to commercial organizations who would derive profit by making the system proprietary and for sale.*

3

Another concern of mine with respect to the use of TAXIR is that in addition ~~to those~~ there are many ~~additional~~ concepts/to those dealing specifically with the computer program ~~which~~ where training is necessary to make the most appropriate use of the system. Few people have looked more deeply into this aspect than I, and those who now work with ENVIR, namely Mr. Henry Fleming and Dr. S. G. Appan, who are employees of GURC. I know that there are many different ways to construct data so that ~~it is possible to~~ all of the value of the information may be extracted. The nature of the descriptors for TAXIR, the varying ways in which one may instruct the system to store and retrieve the data, the structure of data banks, and the efficient management of these ~~are~~ items of great significance, not normally recognized by most scientists. We encourage potential users to again enter into some sort of contract to be given the most efficient training in these aspects.

Neither of the above types of training must be followed, but it is my experience that without the formal training, most people do not get full benefit from the systems, and under these circumstances, may tend to criticize the system, rather than themselves.

To reiterate: The present version of TAXIR which is in my hands is not the same version that was developed with public money, and the version that was developed with public money is available to those who can pay the costs to have that version copied. I will make ^{later} my version available to those ~~which~~ who have legitimate problems, at cost, without compensation to me. I urge those that would use the system be properly trained in both the data handling aspects and the computer program aspects. I believe this to be in the proper ^{it} scientific spirit, and should not be misunderstood that I am trying to make a financial profit from the sale of the system. As a Professor of Biology at the University of Colorado, I am not obligated by any regulation or law to provide service other than that required by the University. In the spirit of science, I offer these services where they will be most effective.

Lest it appear that this letter is an attempt to derive funds for the forthcoming development of the pilot study, let me set your mind at rest. I have a graduate student who will be assigned to test some of the ideas of the pilot study, using TAXIR, at no cost to anyone other than my own funds. ~~Skewy, good to know~~ If, in the future, we are successful in attracting appropriate financial support, then I will expect these funds to be used in those of part for/our activities, ~~xxxxxx~~ which are clearly identified as work for the development of the genetic resource centre information management system.

See (L) from J. Hanks dated Aug 18/72 in the
In File since unable to photostat (L)

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29th June 1972 - Professor J. G. Hawkes,
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COMPUTER LOCATION OF INFORMATION CALCULATED

USING THE COMPUTER BOOLEAN CAPABILITY

NO LINEAR SEARCH

PRINT: LATITUDE, LONGITUDE FOR DEEP-SEA PHOTOS WITH
CRUISE NO., 2 MENZIES*

PRINT: PHYTOPLANKTON BIOMASS FOR THE 3-DIMENSIONAL
SPACE WITH LATITUDE, FROM 390000 DEG TO 410000
DEG AND LONGITUDE, FROM 710000 DEG TO 730000
DEG AND DEPTH, FROM 10 M TO 50 M AND MONTH,
JUNE OR JULY OR AUG AND NOT YEAR, 1968*

DATA FORMAT FLEXIBLE & FREE FIELD

ALPHABETIC INFORMATION

NUMERIC INFORMATION

CODED INFORMATION

ORDERED INFORMATION

DICTIONARIES AUTOMATICALLY CREATED FROM INPUT DATA

USE OF NATURAL LANGUAGE IN COMMANDS

UPDATE FACILITY

ITEMS OPEN ENDED

ADD MORE DESCRIPTORS

DELETE ITEMS

CREATING DESCRIPTORS FROM EXISTING DATA

CORRECTING & EDITING FACILITY

NO. OF ITEMS & DESCRIPTORS VIRTUALLY UNLIMITED

OUTPUT IN THE FORM OF CRT, PLOTTER OR PRINTER

COMPLETE BOOLEAN CAPABILITY

FLEXIBLE SELECTIVE RETRIEVAL CAPABILITY

INFORMATION ORGANIZED & CLASSIFIED

RAPIDITY OF RESPONSE TO QUERIES

SIMULTANEOUS SELECTIVE RETRIEVAL FROM

DIVERSE/DISPARATE INFORMATION BANKS

USING ENVIR AS AN EXECUTIVE SYSTEM TO DRIVE
AND SUPPLY INFORMATION TO OTHER PROGRAMS

- PLOTS
- CONTOURS
- STATISTICAL PACKAGES
- GRAPH
- CHARANAL
- EVOLVE
- BIO-INDICES
- BIOMASS
- BIOENERGETICS
- TG4DA
- CONSTANTS & COEFFICIENTS FOR MODELS

PLATE 1.

ENVIR is not an IR Program, rather, it is a compiler - it designs an "Information Retrieval Program" to the specifications of the user; it edits and organizes information as well as prepares data for input to models, statistical programs, plot routines, etc.

1. Designed by biologists

2. Concerned with IR since mid 1700rds

Linne - classification - Dewey System -

Library of Congress - hierarchies - key words.

PLATES 2, 3, & 4

The INFORM-ENVIR system operates at MTF on the UNIVAC 1100 within 32K. We expect to be able to overlay parts of the program so that it will work at small installations at marine and environmental laboratories and offices, on shipboard, etc.

The concept of a "Compressed Chi function" accounts in large part for the storage efficiency of ENVIR. Let us briefly look at what occurs. Assume that the data is being entered on cards. We will have one too many cards for each item - an item is anything that we are describing: nuts and bolts, books, equipment, butterflies, isopods, rivers, lakes, environments, etc. The descriptions are put on the cards sequentially such as with screws - round headed, 1/4 (for diameter), 2 (for length in inches) iron (for type of metal), etc. The program automatically keeps track of all the states assumed by the items and assigns to each state a binary code - for instance: 01 for red, 10 for white, 11 for blue, etc. One can see that if one continues the progression that the information is compressed geometrically, compressed to the power of the base 2. Eight states will take 3 digits (bits, not words, in the computer) 16 states = 4 bits, 32 states = 5 bits, one UNIVAC word, the number of states equivalent to 11 places. The system was originally designed to work on a CDC 6,000 series and a sixty (60) bit words is astronomical as regard to the number of possible states. (Lose at checkers - loser pays 1 grain of wheat on first square, 2 grains on second square, 4 on third, etc., soon whole ship loads of grain - etc.). It is also true that any numerical information can be kept in this compressed information file (I FILE) alone and only alphabetical information needs a dictionary file. This latter file will be built automatically by ENVIR and results in - say - that some description of 1,000 items taking up 80 or

so alphabetical letters need be entered in the dictionary only once and be referenced by a code 01, the latter being 1/18 of a word.

We have also bought ourselves something else with our binary compressed information file (I FILES). Think in terms of having entered the information linearly and horizontally on cards - one after another. The program inverts this order by standing it on end - Ergo, we have inverted all files - we can extract any description of the whole bank randomly - we do not have to go in and search sequentially. We can also incidentally calculate by the use of Boolean algebra (which is a natural logic of computing machines), the location in I FILES that satisfies the particular query. Due to this feature, the search involves only bit manipulation and we can search at the speed of electricity. (Sic)

(Plate 3). This is a diagrammatic representation of I FILES, you see across the top the items (bit 36 to bit 35 -- partial representation of 36 bit word) -- at query response -- one bit for each item. At item # is a vertical allowance of 7 bits for a representation of 128 items and 7 bits for collector names again for 128 names. The 1000000 may stand for Forsythe-Smith and 0100000 for Robert Smith Jones, FRS. Searches are done in effect by masks laid over calculated areas giving the appropriate responses.

In summary, what we have bought ourselves is:

1. Geometric compression of information
2. All files inverted -- can search for any descriptor or state in bank and also incidentally, for any chosen subset of the bank.
3. Electronic speed -- speed of light
4. Location of information is calculated, not searched for

Finally, tape Q (Query Tape). All information that has been inputted either on paper tape, Hollerith cards, magnetic tape, has been compressed into binary format on tape Q in the appropriate tables I FILES, dictionaries, etc., with proper addresses, etc., for rapid future entry into computer core. In short, the

designed bank does not have to be recompiled as all necessary computer instructions and data are compressed on this binary tape.

PLATE 5

A must in almost every area, and in part in all remaining areas of biology from speciation and evolution through ecology to medical pathology is capability to enter one's information into the computer without the necessity of having fixed fields. Even in the disciplines of chemical pollution allowance has to be made for parameters that exceed the normal range. With ENVIR one need not try to anticipate the largest number of characters for a state of an item but one is free to format it in fixed fields if one wishes.

One can also enter in numbers, words, punctuation marks, mathematical symbols, etc.

If one has alphabetic information in a descriptor (a descriptor is a logical generic term encompassing states which describe an item) it is a NAME descriptor and the descriptive states are nouns, adjectives, verbs, sentences, paragraphs, etc. The program will immediately build dictionaries and the necessary codes and addresses for such information. Cardinal numbers could be included in such a descriptor if one wished.

The information in such a descriptor will be printed out in alphabetical order unless modified by an instruction I shall specify in a moment.

A NUMERICAL descriptor will be contained in I FILES and needs no dictionary. As a matter of fact, only the range of numbers needed will be provided for in I FILES. If we are concerned with data from 1940 to 1970, 2000 positions are not needed - only a sufficient number of bits to contain the difference, 30 is necessary. A numerical descriptor is printed out in numerical order from low to high. One may query all numerical information

in the form of year 1810 to 1850 or depth from 400 to 900 meters, etc.

A CODED descriptor is one in which 1, 2, 3, etc., or + - * is entered as input data and a 'translation' is given to the computer saying that 1 is to print out as 'blue', 2 as 'red', + as 'wide angle lens', etc.

An ORDERED descriptor is one the output order is imposed by the user. We usually want the months of year in normal calendar order rather than alphabetized. It also enables us to ask for all the tests made between March and July.

I have already alluded to the fact that the program automatically creates the needed dictionaries or glossaries. This is done as the Information Bank is being built or added to subsequently.

ENVIR has 20-odd commands from READ DATA BANK FROM TAPE/CARDS to ADD MORE DESCRIPTORS and CORRECTION or MEMO.

PLATE 6.

The ENVIR system allows one to freely enter in new items into an already built INFORMATION BANK. For instance if one, as is customary, obtains a new series of chemical tests of, say, the water in Delaware Bay instead of having to redesign or build a new data bank one simply uses the command ADD MORE ITEMS and the new information is incorporated in the old bank and since the number of items that can be added is virtually open-ended, one may keep one's information bank for years. Typically an information bank is created only once in the life of the bank.

We may, with the appropriate command, add new descriptors to an exsistant data bank if the original bank was not adequately designed or if some new conditions developed that must be provided for.

In this vein we may also create a new descriptor from the information already contained in the data bank. For instance, the percentage of dead organisms for a locality from descriptors, total number of organisms and number of dead organisms.

Sometimes a bank contains items that are no longer pertinent. This is often true of banks containing equipment inventory. A machine wears out, a bottle breaks, or a ship is sold. By the use of the command DELETE ITEMS the chosen items may be purged from the bank.

Any information in the bank may be corrected or changed at will using the command CORRECTION. It does not matter if one wishes to change a letter in a word or a phrase. Any state may be completely deleted as well.

One can ask for vocabulary lists to be printed out and various instruction for the whole bank or part of the bank that were introduced when the bank was built. There are also 70-odd error messages that will be printed out that assist one in editing and cleaning up a bank.

PLATE 7.

We have already mentioned that the number of items that may be entered into a bank is virtually unlimited. If the amount of core available becomes restricted, the compressed information contained in I FILES can be delegated to drums, discs, or tapes, and buffered in as desired. The information on this peripheral equipment is organized, of course, and no searching is required. The peripheral equipment is being used only as auxiliary memory. The number of descriptors that can be used to describe an item is similarly virtually unlimited. We have never exceeded the core memory but if an occasion arose, the same buffering from auxiliary memory could be used.

Output may be in any of the usual output devices. CRT tubes, for instance, in which one could be in a conversation mode with the data bank. Another output is on plotters, either on flat bed or micro-film. The most frequent output is the usual hard copy from the high speed printers. This output might simply be a single item noted or a reply involving some hierarchical classification of the whole bank. Multiple copies may also be made.

PLATES 8 & 9.

We have already mentioned that we use the Boolean capabilities of computers for many of the internal operations within the computer. We also use the logical power of Boolean algebra to query and organize the data into meaningful operations. It buys us both the simplicity of Boolean logic as well as all the possible logical complex permutations that could be required. For instance, given that we had 50 descriptors in a bank, we could have 2^{50} different logical combinations or sets developed from the bank.

Let us briefly discuss the Boolean partitions of a query or print command. It is convenient to divide Boolean sets into two types. One consists of a list of names such as of the people in the room -- Tom, Dick, Harry, etc., and the other a logical partition such as all the people in this room above 40 years of age, or twenty years of age, or all the people with brown eyes or all the people with green and blue eyes, etc.

In a print statement, the second part of the statement deals with the sub-set (it may be the whole bank) that one wishes to be organized or classified in the mode that one specifies in the first part of the print statement.

(The above covers the first 3 parts of Plate 8.)

One reason of course that queries are answered so rapidly is that computers are internally designed around Boolean algebras and naturally respond well to input arranged in a Boolean mode.

PLATE 9.

Here is an example of two queries in a Boolean format.

We want in the first print statement all the photos taken by Menzies on Cruise 2, hierarchically classified first by latitude and secondly by longitude. The list (namely, the Tom, Dick, and Harry) is the early part of the command and the program considers the list terminated at the 'FOR' and then expects but does not require some statement that helps to make the expression more meaningful to humans. The subset that we wish to have classified follows the word WITH; in this instance the second Menzies cruise.

The second print statement is the same.

We want the Phytoplankton Biomass (ends at FOR), the three-dimensional space (human noise ending at WITH) for the subset which satisfies the following restrictions:

1. It is between 39 & 41 degrees Latitude
2. It is between 71 & 73 degrees Longitude
3. It is between 10 & 50 meters in depth
4. For only the months of June, July, or August
5. Excluding the collections in 1968

PLATE 10.

Suppose we wished to print the answer to the following.

'List all phytoplankton species and zoo plankton species FOR
Glaveston Bay with arsenic concentrations from .001 parts per billion
to 101 parts per million or cyanide concentrations from 01 parts per
million to .1 parts per million for the years from 1965 to 1968.'

This information would almost inevitably be in several different
banks.

1. An algae bank made by botanists.
2. An invertebrate bank made by zoologists.
3. A chemical pollution bank built by chemists or people
concerned with water quality.
4. The latter banks might be separate banks for each year.

So to satisfy the requirements of the information manager or
decision maker, at least three and possibly six banks must be amal-
gamated. The ENVIR command structure enables one to combine the requi-
site parts or whole diverse or disparate banks together to satisfy
sub queries.

PLATE 11.

In conclusion, ENVIR calls on models and programs to graphically illustrate the information in the bank or to alter and manipulate this information in certain specified ways.

It calls on certain plot programs that will, for instance, plot the pollution of a certain chemical against the time of day, or plot on a map the longitude and latitude of certain species of animals or 'curves of best fit' to data extracted from some data bank.

A contouring program will connect with contour lines areas of equal biomass, species diversity, areas of equal pollution, equal depth in the ocean, or altitude on land, etc.

The Graph program very simply put (a 3 or 4-point university course has been given on this program alone) clusters objects on the basis of their overall similarity and gives a measure of the homogeneity of these clusters and the difference between the clusters themselves.

The CHARANAL program, also a university course, uses the Shannon-Weaver information-Theoretic measure of information content to measure the redundancy of environmental or biological data. It gives a measure of the dependency or correlation between information carrying descriptors. It is perhaps the only program designed (sic) to specifically quantify the correlation of qualitative data as opposed to quantitative data with which the 15-odd statistical packages that we have tied on to the ENVIR are designed to handle. We have, for instance, just tied on a very sophisticated least squares routine developed by the Bureau of Weights and Measures at Boulder, Colorado.

The program EVOLE prints out lines of minimum steps for biological information which can be ordered. It is sort of a PERT program of organic evolution.

Bio-indices, biomass calculations and biospecies diversities are calculating programs for use primarily in assessing the health, or at least condition, of the environment.

ENVIR

A COMPILER OF INFORMATION BANK

DATA COMPRESSION

- OPERATES AT MTF WITHIN 32K
- INFORMATION FILES (INVERTED)
- TAPE-Q (INFORMATION BANK)

3
Henry

		I FILES															
		← BITS →															
		36															25
QUERY RESPONSE	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
	3	0	1	1	0	0	1	1	0	0	1	1	0	1	1	0	0
	4	0	0	0	1	1	1	0	1	1	1	1	1	0	1	1	0
	5	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DD(6) ITEM NUMBER	9	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DD(1) COLLECTOR	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ENVIR

A COMPILER OF INFORMATION BANKS

designed by Biss.

concerned with IR since 1750

collected + kept their own files

Tweede - Singapore.

ENVIR - is not an IR Program

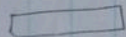
It is a Compiler - it designs
the IR to the specifications of the
user + it organizes inf. for input to
models, stat prog.

DATA COMPRESSION

- OPERATES AT MTF WITHIN 32K
- INFORMATION FILES (INVERTED)
- TAPE-Q (INFORMATION BANK)

Ship ^{board} station
Marine
Environmental
labs or offices.

item [→] Inspect.
Cards
key tape



we have
thought.

all. Inverted files
compressed
diff. approach geometrically
calculate loc. of inf.
56 bits of a line

COMPUTER LOCATION OF INFORMATION CALCULATED

USING THE COMPUTER BOOLEAN CAPABILITY

NO LINEAR SEARCH

DATA FORMAT FLEXIBLE & FREE FIELD

ALPHABETIC INFORMATION - dict. ^{nouns}
^{verbs}
^{paragraphs}

NUMERIC INFORMATION - from to

CODED INFORMATION - go in with 1 - out blue

ORDERED INFORMATION Jan, Feb, March.

DICTIONARIES AUTOMATICALLY CREATED FROM INPUT DATA

USE OF NATURAL LANGUAGE IN COMMANDS

6

UPDATE FACILITY

ITEMS OPEN ENDED

ADD MORE DESCRIPTORS -

CREATING DESCRIPTORS FROM EXISTING DATA -
new percent of full.

CORRECTING & EDITING FACILITY

extracted # of dead organisms. from
name of organism itself

NO. OF ITEMS & DESCRIPTORS VIRTUALLY UNLIMITED

OUTPUT IN THE FORM OF CRT, PLOTTER^{OR} PRINTER
- manual -
- plotter -
- hardcopy

COMPLETE BOOLEAN CAPABILITY

FLEXIBLE SELECTIVE RETRIEVAL CAPABILITY

INFORMATION ORGANIZED & CLASSIFIED

RAPIDITY OF RESPONSE TO QUERIES

PRINT: LATITUDE, LONGITUDE FOR DEERSEA PHOTOS WITH
CRUISE NO., 2MENZIES *

PRINT: PHYTOPLANKTON BIOMASS FOR THE 3-DIMENSIONAL
SPACE WITH LATITUDE, FROM 390000 DEG TO
410000 DEG AND LONGITUDE, FROM 710000 DEG
TO 730000 DEG AND DEPTH, FROM 10 M TO
50 M AND MONTH, JUNE OR JULY OR AUG
AND NOT YEAR, 1968 *

SIMULTANEOUS SELECTIVE RETRIEVAL FROM

DIVERSE/DISPARATE INFORMATION BANKS

Fish, plankton, Birds, Physics.

USING ENVIR AS AN EXECUTIVE SYSTEM TO DRIVE
AND SUPPLY INFORMATION TO OTHER PROGRAMS

- PLOTS
- CONTOURS
- STATISTICAL PACKAGES
- GRAPH
- CHARANAL
- EVOLVE
- BIO- INDICES
- BIOMASS

• Bio species diversity



The University of Birmingham

DEPARTMENT OF BOTANY

The University of Birmingham, P.O. Box 363, Birmingham B15 2TT
Telephone 021-472 1301

Mason Professor of Botany: J G Hawkes Sc D

Professor J. G. Hawkes' home telephone No. (021) 427-2944

JGH/DMW

23rd June 1972

Dear Dave,

Workshop on Information Systems for World Genetic Resources
Birmingham, England
4th - 5th July 1972

The Workshop will be held in The Seminar Room (N105) in the Department of Botany on the first floor of the Biology Building. The first session will begin at 9.30 a.m. on 4th July; thereafter, the times and lengths of the sessions can best be agreed by ourselves during the meetings.

As you know, accommodation is being arranged at the Norfolk Hotel and transport to the University and back to the Hotel will be provided. We can take luncheon at mid-day in the University and supper either at the University or the Hotel according to whether we want to extend the sessions into the evening.

Although the sessions will be kept as informal as possible it may perhaps be useful to have a few introductory items planned in advance. Therefore, if you feel you would like to present your work or ideas in the form of a short prepared talk of from ten to twenty minutes, please feel free to do so. If you can let me know beforehand whether you would wish to present such a talk this would help with the forward planning. Otherwise, it would be in order to let me know on the evening of 3rd July or even during the Workshop itself.

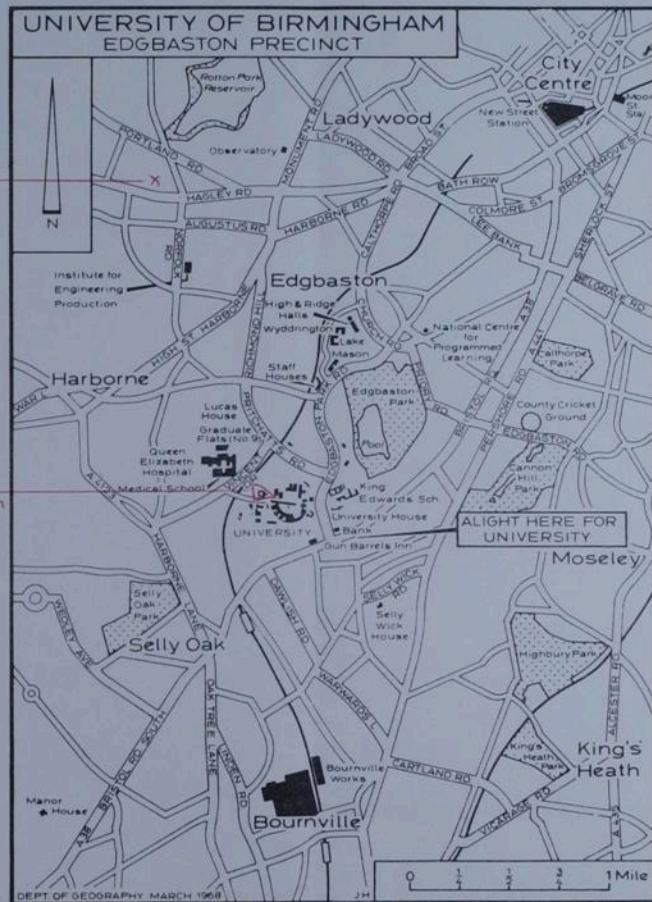
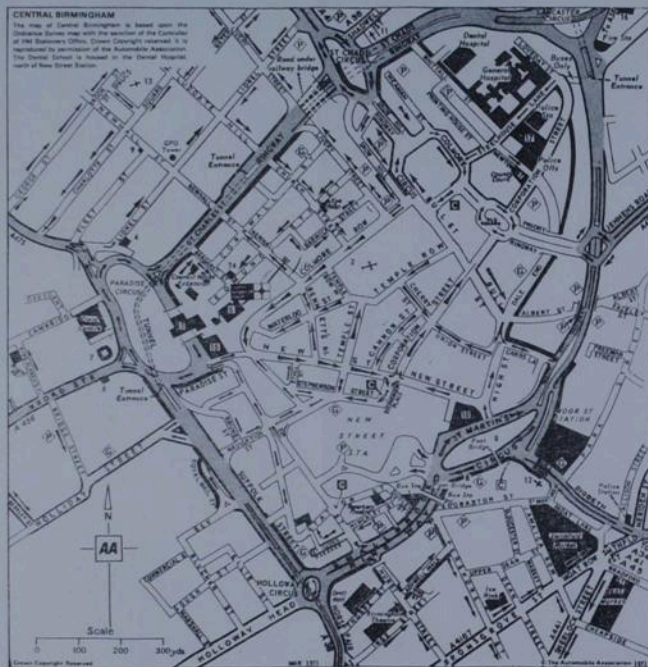
I very much look forward to seeing you in Birmingham.

Yours sincerely,

Jack.

J. G. Hawkes

*This is
a 'must'
for you!*



Please address any reply to
THE DIRECTOR
and quote:
Your reference:

ROYAL BOTANIC GARDENS
Kew, RICHMOND, Surrey, England
Telegrams: Kewgar, Richmond, Surrey
Telephone: 01-940 1171

21 June 1972

Prof. D J Rogers
Gulf Universities Research Corporation
Mississippi Test Facility
Building 1100 Rm. B-313
BAY ST. LOUIS
Mississippi 39520

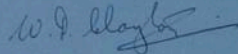
Dear Professor Rogers

Dr Bisby has been commenting on some of our information retrieval problems, and has drawn our attention to your TAXIR system. This seems to have excellent characteristics for our purposes, and he has suggested that I should write to you about it.

The immediate problem is to catalogue material held in a cold storage seed bank, but there are several other fields which involve specialized collections such as timber specimens.

I don't know how you feel about making the program available to us, but we should certainly like to know more about it and, if possible, to run it on our Ministry's ICL 1907 computer.

Yours sincerely



W D Clayton
Computer Liaison Officer

DC

JUN 27 10 02 AM '72

WUI PD INTL

BIRMINGHAM 35 26 1153

LI DR DAVID ROGERS, INFORMATION MANAGEMENT CENTRE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MISSISSIPPI

TEST FACILITY BAYSTLOUISMISSISSIPPI 39520USA

DR BISBY MEETING YOU 2ND JULY LONDON AIRPORT STOP OFFERS

ACCOMMODATION BRINGING YOU TO BIRMINGHAM JULY 3RD RXXX GREETINGS

JACK

958A CDT

CLEAR

JUN 27 10 02 AM '72

WUI PD INTL

BIRMINGHAM 35 26 1153

LT DR DAVID ROGERS, INFORMATION MANAGEMENT CENTRE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MISSISSIPPI

TEST FACILITY BAYSTLOUISMISSISSIPPI 39520USA

DR BISBY MEETING YOU 2ND JULY LONDON AIRPORT STOP OFFERS

ACCOMMODATION BRINGING YOU TO BIRMINGHAM JULY 3RD RXXX GREETINGS

JACK

958A CDT

CLEAR

JUN 27 12 07 PM '72

WU2 PD VIA RCA JUNE 27 BIRMINGHAM JUNE 727
LT DR DAVID ROEGERS INFORMATION MANAGEMENT CENTRE NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION MISS TEST FACILITY BAY ST LOUIS MISS

DR BISBY WILL MEET YOU 3RD JULY AT AIRPORT

JACK
(1205P CDT)
CLR

MIN

JUN 27 12 07 PM '72

WU2 PD VIA RCA JUNE 27 BIRMINGHAM JUNE 727
LT DR DAVID ROEGERS INFORMATION MANAGEMENT CENTRE NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION MISS TEST FACILITY BAY ST LOUIS MISS

DR BISBY WILL MEET YOU 3RD JULY AT AIRPORT

JACK
(1205P CDT)
CLR

MIN

16th May, 1972.

THE UNIVERSITY,
SOUTHAMPTON,
SO9 5NH

Dear Dave,

Thanks for your letter. I certainly will go ahead with trying to interest the Birmingham people in CARANAL and GRAPH. Do let me know when you are actually coming over in the Summer as I would like to see you sometime. Unfortunately, I am going out in the 'Bush'. I shall be leaving Southampton on the evening of 3rd July and not returning until the evening of 27th July. However, if I miss you here, there is a chance that I may be able to call on you at ~~Bordeaux~~ ^{Bordeaux}, as I shall be over in the U.S. for August and part of September. Perhaps you could also let me know when you will actually be in ~~Bordeaux~~ ^{Bordeaux} in that period.

I am writing to you because another possibly much more important item has cropped up. I understand that the Royal Botanical Gardens at Kew are at present looking into possible information retrieval systems to be used on their Herbarium and garden material. I have been approached informally on this, and think that they may very easily be interested to talk about TAXIR. As you no doubt realise, this would be a very important contract, that is if you are interested and able to get it. What I will do is mention your name to the Kew people while I am waiting for a reply from you. If I am right in assuming that you would really be very interested in this, then perhaps you could suggest what would be the best way for you to tell them about your system. For instance, would it be possible for you to see the people at Kew when you are over here this Summer?

Do let me know as quickly as possible about this.

Best wishes,

Yours sincerely,

Frank

Dear Jack:

I made one day's mistake in my arrival date--it is the 3rd, instead of the second, same airline, same arrival time. Perhaps some of the people at Kew will be coming up to Birmingham for the meeting, and I could come up with them. I am pleased to accept your kind invitation to stay with you and Barbara. Thank you kindly.

For the meeting, I suggest a review of the work we did at Izmir, for half a day, to include the organization of data for various levels of operation of the gene bank; then perhaps another half day for user-oriented description of available computing systems; another half day for integration of data gathering systems and computing systems (how to make a systematic work plan); and at this moment, I run out of steam for the last half day. Perhaps this is useful to you.

Hopefully, after the meeting, I will have a chance to ~~get~~ speak to the interested parties at Kew, although they have not made any ~~kind of~~ effort to contact me for that purpose. I don't know whether they want me to or not. I do know that Dr. Gilleen Prance of the New York Botanical Garden (whom I believe will be attending your workshop) wants to go down to ~~the~~ Kew with me, ~~and that the expenses have been arranged for him to~~ to talk about possible interest at Kew in TAXIR. Dr. Prance, who was a student of Frank White's at Oxford, and with whom I have worked on other computer taxonomy problems, has been given the charge to select a system for the New York Botanical Garden, and has spent some time here examining TAXIR and the allied computer programs GRAPH and CHARANAL.

*Looking forward to see you Monday, July 3.
Sincerely,*



The University of Birmingham

The University of Birmingham, P.O. Box 363, Birmingham B15 2TT
Telephone 021-472 1301

From: Professor J. G. Hawkes,
Department of Botany

Dr. David J. Rogers,
Information Management Center,
National Aeronautics and Space Administration,
Mississippi Test Facility,
Bay St. Louis,
Mississippi 39520,
U.S.A.

JGH/DW

16th June 1972

Dear Dave,

I was delighted to get your telegram on 14th June telling ^{me} that you were definitely coming to the Workshop. It will of course be much better to have you there than Harriet Meadow from the point of view of sorting out a final system for genetic data management. Nevertheless, I am sorry that she has not found it possible to attend. I am notifying Bisby and the Kew people that you plan to arrive on the 2nd July and assume that you would like them to meet you at London Airport. Please let me know whether you want to travel up to Birmingham on the 2nd or 3rd? As you will remember, the Workshop is on the 4th and 5th July. We should be delighted for you to come on the 2nd if you feel like doing so, so that we could have a look around the Department on the 3rd and begin some talks about how the Workshop might be organised. If you would like to send me any ideas by post meanwhile I should be most grateful, since I have done nothing yet about the organisation before noting who was able to attend.

I wonder if you would like to tell me whether you would prefer to stay in an Hotel or with me for the nights you are in Birmingham. It goes without saying that Barbara and I would be delighted to have you as a guest in our house and I do hope you will feel free to make this choice if you would like to.

Best wishes,

Yours,

Jack

J. G. Hawkes

Ans. 6/21/72

JUN 12 1 07 PM '72

Q

WU001 ZC045 A EF URNX HL GBEM 040 BIRMINGHAM 40 12 0925
PMS LT DOCTOR DAVID ROGERS INFORMATION MANAGEMENT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MISS TEXT FACILITY BAY ST LOUIS MISS

IF DOUBTFUL ABOUT ATTENDING WORKSHOP PLEASE ADVISE IMMEDIATELY
STOP HARRIET MEADOW LACKING FUNDING WITHDRAWN STOP
THEREFORE WORKSHOP CANCELLATION NECESSARY WITH YOUR GREETINGS

JACK
104P

JUN 12 1 07 PM '72

Q

1508 101/100-527

WU001 ZC045 A EF URNX HL GBEM 040 BIRMINGHAM 40 12 0925
PMS LT DOCTOR DAVID ROGERS INFORMATION MANAGEMENT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MISS TEXT FACILITY BAY ST LOUIS MISS

IF DOUBTFUL ABOUT ATTENDING WORKSHOP PLEASE ADVISE IMMEDIATELY
STOP HARRIET MEADOW LACKING FUNDING WITHDRAWN STOP
THEREFORE WORKSHOP CANCELLATION NECESSARY WITH YOUR GREETINGS

JACK
104P



The University of Birmingham

The University of Birmingham, P.O. Box 363, Birmingham B15 2TT
Telephone 021-472 1301

From: Professor J. G. Hawkes,
Department of Botany.

David J. Rogers,
Gulf Universities Research Consortium,
GURC Field Office,
NASA/Mississippi Test Facilities,
Bay St. Louis,
Mississippi 39520,
U.S.A.

JGH/DMM

7th June 1972

Dear Dave,

Thanks for your further letter of 31st May and a copy of yours to Mr. John Wrigley. I am very glad you have written to him because I wrote to León and got no assistance whatsoever from that source. I do not know about Wrigley although I understand there has been some cool feelings between León's office and Wrigley's through some mistake made by Erna Bennett in the past. I do hope your letter will have the desired effect of providing funds for you since I am most anxious for you to attend one way or another. I think this Workshop is going to be particularly valuable to everybody and should really provide the stimulation to our selecting the right sort of systems for genetic information. Personally I hope that TAXIR will be chosen but I feel that it is very proper for those with other views to be allowed to put these views forward.

By now you will have had my letter of 1st June telling you that I have been in touch with the Kew people, but that although they are interested in the meeting they are not able to provide funds for overseas speakers. I hope that Bisby will be able to come to it but since you say he does not know the TAXIR system, I am very glad you are suggesting that you will write to him about his possible key role for TAXIR in England and elsewhere in Europe.

May I say again how much I look forward to your attending the meeting. If you are coming on your own funds I shall of course be happy to give you accommodation and pay for meals from my departmental funds. Unfortunately, I can do nothing about international air ticket funds though I am trying to get Sir Otto Frankel to make available some IBP moneys for you. So far there has been no success in this direction either. However, when I think of the enormous difficulties which were successfully overcome in bringing everyone to Izmir for the April meeting I still do not feel too pessimistic about the meeting in April. *only.*

Best wishes,

Yours ever,

Jack

J. G. Hawkes

(continued ...)

P.S.

I have now had a very exciting letter from Professor Scarascia of Bari saying that they will almost certainly be able to provide £100 or a little more from the National Research Council of Italy for you. If IBP comes along with another £150 you will not be too far away from the cost of your air fare. I believe it would be worthwhile going ahead with bookings and I shall keep you informed as soon as I have definite news for you.

Jack

J.G.H.



The University of Birmingham

The University of Birmingham, P.O. Box 363, Birmingham B15 2TT
Telephone 021-472 1301

From: Professor J. G. Hawkes,
Department of Botany.

David J. Rogers,
Gulf Universities Research Consortium,
GURC Field Office,
NASA/Mississippi Test Facility,
Bay St. Louis,
Mississippi 39520,
U.S.A.

JGH/DMW

1st June 1972

Dear Dave,

Thanks for your letter of 24th May. My own of 23rd May will have crossed yours in the post, but here is some additional information in reply to your letter.

I have been on the telephone to the Director of Kew and he says that either Peter Green, Roger Polhill or Bill Clayton will have been in contact with Dr. Bisby at Southampton. I have invited Bisby to take part in the Workshop so that if you can manage to come you will see him then. In any case Kew knows about the Workshop and are planning to send someone to Birmingham for the meeting. Very unfortunately, the Director of Kew, who is an old friend of mine, cannot help with travel support funds on your behalf, even though they are most interested to have you here for the meeting.

I have also had no success with the Royal Society because the next meeting of the Travel Funds Committee is on 6th July, two days after the end of our own meeting. The Committee unfortunately does not like retrospective requests for funds. So this leaves us with nothing for you unless we can manage to get something from IBP or from FAO at Rome. The prospects do not look very bright at present, I am sorry to say. However, we will still keep hoping.

Best wishes,

Yours ever,

J.G. Hawkes

P.S. Thanks for the copies of the tables you sent under separate cover, which arrived at the same time as your letter - J.G.H.



The University of Birmingham

The University of Birmingham, P.O. Box 363, Birmingham B15 2TT
Telephone 021-472 1301

From: Professor J. G. Hawkes,
Department of Botany.

David J. Rogers,
Gulf Universities Research Consortium,
GURC Field Office,
NASA/Mississippi Test Facility,
Bay St. Louis,
Mississippi 39520,
U.S.A.

JGH/DMW

23rd May 1972

Dear Dave,

Many thanks for letting me know in your letter of 19th May that you have no changes to make in the abstract of the paper you so kindly presented at Izmir.

I was interested to hear of the responses from various sources in FAO to your TAXIR system. I only wish that FAO could put this response into some more clearly defined financial help, since at present they have said to me that it will be extremely unlikely for funding to be provided for our meeting in July. I have now written round to the Gene Banks to ask whether any funding could be provided from these sources and I am waiting to have their replies. If nothing comes of it then I shall regretfully have to cancel the meeting.

There is one way in which it occurs to me you might be in a position to help. As you know, our first idea was to hold the meeting in Rome but because I myself could not get funds for a visit there, and in many ways it was easier to arrange the Conference at Birmingham, I changed the venue. If, however, you have some fairly certain information from your contacts in FAO that ~~as they~~ would be willing to invite you over at their expense to Rome in the near future, and hopefully in July, perhaps we could work it that we could change the venue back to Rome again. However, the melancholy facts are generally that FAO may react enthusiastically to a proposition but does not generally seem to dispose of the funds to back this up. I am afraid this may be the position at present. Let me know what you think and if there is some chance of getting you across on funds from whatever source we will see whether we can do it.

Best wishes,

Yours,

Tack

G U R C

Gulf Universities Research Consortium

GURC Field Office • NASA/Mississippi Test Facility
Bay St. Louis, Mississippi 39520 • (601) 688-3760

May 31, 1972

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Mr. John Wrigley, Chief
Computer Branch
F.A.O.
Via delle Terme di Caracalla
Rome, 00100, Italy

Dear Mr. Wrigley:

I just received the disturbing news that a workshop on information management for world genetic resources, organized by Dr. Jack Hawkes, The University of Birmingham, has not been underwritten by FAO, as Dr. Hawkes had anticipated.

I do not know through which branch of FAO Dr. Hawkes' request for financial assistance was channeled, but it probably was through Dr. Leon's office.

Of all the organizations that I know who are in the process of getting their data into a computerized information system, the genetic resource people are the closest to realizing that ambition. As you know, I worked with these people at a meeting in Izmir, just before coming to Rome, and you may also know that I was an FAO consultant to that meeting.

The planned workshop, to be held in Birmingham July 4 and 5, was to move towards decision on the systems to be employed. Having gone as far as they have, and having shown their earnest desire by expenditure of much of their own funds, it would be a grave error not to put financial resources behind this particular meeting, when so much time and money has already been devoted to the preliminary work.

I write to urge that you use your influence to get funding from FAO to Dr. Hawkes, as soon as possible.

Sincerely,

David J. Rogers
Dr. David J. Rogers
Project Coordinator

DJR:mw

May 31, 1972

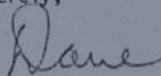
Dear Jack:

The enclosed letter may or may not be useful in getting funds for the workshop. I don't know how much of a role Wrigley plays but he may be influential.

Since it sounds as though the meeting will be held under any circumstances, I am going to do my best to find some funds to make the trip, even if personal.

I hope that you had a chance to get in touch with the interested people at Kew who sound as tho they may be interested in TAXIR. As earlier indicated, Bisby does not know the TAXIR system, however, he probably can pick up on it in very short order. I will communicate with him about his possible "interface" for TAXIR in England.

Sincerely,

A handwritten signature in cursive script, appearing to read "Dave".



The University of Birmingham

DEPARTMENT OF BOTANY

The University of Birmingham, P.O. Box 363, Birmingham B15 2TT
Telephone 021-472 1301

Mason Professor of Botany: J G Hawkes Sc D

Dr. D. J. Rogers,
Information Sciences Project Co-ordinator,
GURC Information Management Center,
Mississippi Test Facility,
Bay St. Louis,
Mississippi 39520,
U.S.A.

JGH/DMW

26th May 1972

Workshop on Information Systems for World Genetic Resources
Birmingham, England
4th - 5th July 1972

Dear Dave,

At the Gene Banks Meeting which was recently held at Izmir it was felt rather strongly that it would be extremely useful to arrange a further meeting on Information Systems for World Genetic Resources in the form of a discussion group or Workshop. It is believed that a number of workers concerned with information storage and retrieval at gene banks and elsewhere, as well as Systems Managers and Computer Programmers, would be interested in attending such a meeting. Miss Harriet Meadow, (Systems Development Manager) and Dr. Stan Shetler (Program Director) of the Flora North America project have kindly agreed to attend, and it is hoped that funds will be forthcoming to bring across Dr. Dave Rogers (Information Sciences Project Co-ordinator of the Gulf Universities Research Consortium and creator of the TAXIR system) from the U.S.A. also.

The Workshop will be held in the Department of Botany, University of Birmingham, on 4th and 5th July (or longer if necessary). Please let me know as soon as possible if you plan to attend, and whether you would like me to reserve hotel accommodation for you. (State nights: 3rd, 4th, 5th July, etc.)

I look forward to welcoming you to the Birmingham meeting.

Yours sincerely,

I still haven't got funds for you, but we shall run the meeting & still hope to get them somehow. I am inviting Jack.

J. G. Hawkes

Bisby, so if you can't come perhaps he could speak for you. We are seeking 150 funds in London for

May 24, 1972

Dr. J. G. Hawkes
The University of Birmingham
P.O. Box 363
Birmingham, England

Dear Jack:

With respect to the possible trip to Birmingham in July, I have the following projected possibilities for assistance in financing.

Dr. Frank Bisby, Dept. Botany, The University, Southampton, has just written with the information that Kew Gardens have contacted him to help find an appropriate information retrieval system for their various needs. He suggested that I might be interested to present to them the concepts and usefulness of TAXIR, and that there might be an opportunity to do so before or after our meeting in Birmingham.

Bisby does not know the system TAXIR, having only studied our two other major taxonomic computer programs, but he should be the best person in England to quickly become familiar with the system since he already has a background which would make it easier for him to become thoroughly grounded in the information retrieval system.

Would you want to call Bisby to ask him the person(s) at Kew who have contacted him for information retrieval? He would, I am certain, be glad to put you in touch with the Kew people, and you might suggest to them that, if they are interested in a presentation on TAXIR, they might help you to support my travel to England.

I recognize that this is very short notice for such arrangements, but it might be managed, and would, I think be beneficial for all concerned. If TAXIR were established at Kew, it could then be more readily made available to others in England who would like to have it.

I trust these suggestions are acceptable.

I put into the mail yesterday some fairly clean copies of the tables presented at Izmir. Unfortunately, the originals of those tables are no better than the copies I sent.

Sincerely,



The University of Birmingham

The University of Birmingham, P.O. Box 363,
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Telephone 021-472 1301

From: Professor J. G. Hawkes,
Department of Botany.

David J. Rogers,
Gulf University Res. Consortium,
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Bay. St. Louis,
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JGH/DMW

18th May 1972

Dear Dave,

In connection with the paper that you read at the Izmir Conference and the proposed publication by the Eucarpia Secretariat I wonder if it would be possible for you please to send me the originals of the illustrations and tables. The copies I have with me are not too well produced and Eucarpia will need the originals to get good quality when they are put on to photo-litho.

Best wishes and looking forward to hearing from you soon.

Yours,

Jagh

J. G. Hawkes

May 19, 1972

Dr. J. G. Hawkes
Dept. of Botany
The University of Birmingham
Birmingham B15 2TT

Dear Jack:

It must be clear, though you have had no recent response from me, that I did not wish to make any changes in the abstract of my Izmir presentation.

I was very pleased by all the activities at Izmir, and that things are moving ahead towards a goal I am sure you have had for some time. I am also pleased that I may make a small contribution towards those goals.

In Rome, at FAO just after leaving Izmir, I found considerable interest in many different areas where there is a need for TAXIR, so I trust that we can somehow achieve coordination with these additional efforts. For example, there was a working committee on data management for soil sciences meeting at FAO when I was there. I made a brief presentation to that committee at the invitation of the FAO people, and as a result, have had several inquiries about possible use of TAXIR from soil scientists in Canada, in the Netherlands, and in Australia! It becomes difficult for me to keep up with all these requests, and hope, therefore, that FAO can help with the proper integration of our efforts. I am writing to Jorge Leon about this now, because I need some help to support all these different efforts.

I hope that you will soon have some definite information about the July meeting in Birmingham. I've left the dates open, but am finding difficulty in scheduling around that time for several additional trips I have to make this summer. Please let me know shortly about your success, and the time.

Sincerely,

David J. Rogers



The University of Birmingham

The University of Birmingham, P.O. Box 363, Birmingham B15 2TT
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David J. Rogers,
Gulf University Res. Consortium,
Mississippi Test Facility,
Bay. St. Louis,
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JGH/DMM

20th April 1972

Dear Dave,

This letter is to thank you again for contributing an extremely interesting paper to the Eucarpia Conference on 'European and Regional Gene Banks' at Izmir.

Everyone found the Conference most stimulating and worthwhile. Decisions of considerable importance were taken which will be not only useful to Europe, but to the rest of the world also. As you know we shall be publishing the abstracts of this meeting and you will of course receive a copy. Meanwhile, if there is anything you wish to add to your original abstract, or if you wish to modify it in any way, please let me have a revised draft by not later than 1st May. If I do not hear from you by then I shall assume that you do not wish to make any changes to what you have already submitted.

Again, very many thanks for your valuable contribution.

Yours sincerely,

J. G. Hawkes

P.S. I will let you know shortly about the proposed July meeting which we will hope to hold in Birmingham.



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8 June 1972

Dear Dr. Rogers,

Thank you for your letters of 30 and 31 May. I will reply to the first letter later as it requires some further thought.

As regards the question you raise in your letter of 31 May, I do not know the circumstances of the case as it does not come under my part of the Organization's work program. I understand that Dr. Leon has already written to you. I can only confirm that the whole of the FAO is under very severe financial limitations at the present time which means that we are having to restrict our travel and many of our important program activities even those as valuable as the one you mention.

It is unfortunate for me that the meeting is so early in July. If it had been later in the month I would have attended at my own cost during my leave in England. This is now impossible as our leave schedule for the summer is settled and it is not possible to change without affecting all my colleagues leave plans or to attend earlier as my division has entirely exhausted its travel funds for 1972.

I am sorry that I cannot give a more positive reply but I am sure you will understand.

Yours sincerely,

J. Wrigley
Chief, Computer Systems
Branch

Dr. David J. Rogers
Project Coordinator
Gulf Universities Research Consortium
GURC Field Office
NASA/Mississippi Test Facility
Bay St. Louis
Mississippi 39520