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edited by

Pieter Kritsinger
Computer Science Department
University of Cape Town
PREFACE

Computer science is an emerging discipline which is having difficulty in being recognised as a worthy member of the sciences. I will paraphrase John Hopcroft, co-winner of the 1986 Turing Award, when, during a recent interview, he said that the primary reason for the lack of recognition, is the age of our researchers. Probably not one of the researchers who presented their work at this symposium is older than 45. I know of no computer scientist in South Africa who is in a position where (s)he can affect funding priorities. As far as I know we have no representation on any of the committees of the Foundation for Research Development and for our Afrikaans speaking fraternity, none who is a member of the Akademie vir Wetsenskap en Kuns. It will take time and conscious effort to establish our presence. The same is true of course for our universities. Again, with one exception, I know of no dean of a science faculty, vice-principal or principal who is a computer scientist. We consequently spend an enormous amount of time trying to explain the needs of computer science and its difficulties. I believe this symposium is a further step towards accreditation by our peers and superiors from the other sciences.

The total number of papers submitted to the Programme Committee for consideration was 34. Each paper was reviewed by three persons knowledgeable in the field it represents. Of those submitted, 23 were finally selected for inclusion in the symposium. As a result the overall quality of the papers is high and as a computer science community in Africa we can be justly proud of the final programme.

This is the fourth in the series of South African computer symposia. This year the symposium is sponsored by the Computer Society of South Africa (CSSA), the South African Institute for Computer Scientists and the local IFIP Committee. The executive director of the CSSA and his staff deserve warm thanks for handling the organisation as well as they have, while the Organising Committee provided Derrick and I with very valuable advice.

Finally I would like to express my sincere appreciation to the authors, to the members of the Programme Committee and particularly the reviewers. Without the kind cooperation of everyone, this symposium would not have taken place.

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LAIDLAW Michael  VOS Koos
LAY Peter
# TABLE OF CONTENTS

**Keynote Address**

"An Extensible System and Programming Tool for Workstation Computers." ............................... 1  
Niklaus Wirth, ETH, Zurich

**Invited Lectures**

"The Relationship of Natural and Artificial Intelligence." ...............not included in Proceedings.  
G Lasker, University of Windsor, Ontario.

"Software Engineering: What Can We Expect in the Future?" ...............not included in Proceedings.  
D Teichrow, University of Michigan, U.S.A.

**Computer Languages I**

"SPS-Algol: Semantic Constructs for a Persistent Programming Language." ......................... 13  
S Berman, University of Cape Town.

"Petri Net Topologies for a Specification Language." .... 25  
R Watson, University of the Witwatersrand.

"Towards a Programming Environment Standard in LISP." ... 45  
R Mori, University of Cape Town

"ADA for Multiprocessors: Some Problems and Solutions." ... 63  
J Bishop, University of the Witwatersrand.

**Computer Graphics**

"Polygon Shading on Vector Type Devices." ............... 75  
C F Scheepers, CSIR.

"Hidden Surface Elimination in Raster Graphics Using Visigrams." ......................... 97  
P Gorringe, CSIR.

**Database Systems I**

"On Syntax and Semantics Related to Incomplete Information Databases." ......................... 109  
M E Orlowska, UNISA.

"Modelling Distributed Database Concurrency Control Overheads." ............................. 131  
M H Rennhackkamp, University of Stellenbosch.

**Operating Systems**

"The Development of a Fault Tolerant System for a Real-time Environment." ......................... 149  
M Morris, CSIR.

"A New General-purpose Operating System." ......................... 161  
B H Venter, CSIR.
Computer Languages II

"The Representation of Chemical Structures by Random Context Structure Grammars." ......................... 175
E M Ehlers and B von Solms, RAU.

"A Generalised Expression Structure." ................. 189
W van Biljon, CSIR.

Computer Networks and Protocols I

"An Approximate Solution Method for Multiclass Queueing Networks with State Dependent Routing and Window Row Control." ................................. 203
A E Krzesinski, University of Stellenbosch.

"A Protocol Validation System." ......................... 227
J Punt, University of Cape Town.

Computer Networks and Protocols II

"Protocol Performance Using Image Protocols." ........ 251
P S Kritzinger, University of Cape Town.

Artificial Intelligence

"A Data Structure for Exchanging Geographic Information." ......................................................... 267
A Cooper, CSIR.

"The Design and Use of a Prolog Trace Generator for CSP." ...................................................... 279
D G Kourie, University of Pretoria.

Database Systems II

"An Approach to Direct End-user Usage of Multiple Databases." .................................................. 297
M J Phillips, CSIR.

"A Semantic Data Model Approach to Logical Data Independence." ................................................ 329
S Berman, University of Cape Town.

Information Systems

"The ELSIM Language: an FSM-based Language for the ELSIM SEE." ............................................. 343
L du Plessis and C Bornman, UNISA.

"Three Packaging Rules for Information System Design." 363
J Mende, University of the Witwatersrand.
Computer Languages III

"Experience with a Pattern-matching Code Generator." ... 371
M A Mulders, D A Sewry and W R van Biljon, CSIR.

"Set-oriented Functional Style of Programming." ........ 385
C Mueller, University of the Witwatersrand.

Tutorial

The use of Modula-2 in Software Engineering." ........... 399
N Wirth, ETH, Zurich.
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>07h30</td>
<td>Registration and Coffee.</td>
</tr>
<tr>
<td>08h45</td>
<td>Welcoming address, President of the South African Institute of Computer Scientists, Dr. G. Wiechers.</td>
</tr>
<tr>
<td>09h00</td>
<td>Invited Lecture. Professor D. Teichrow, University of Michigan. Software Engineering, ... What Can We Expect in the Future.</td>
</tr>
<tr>
<td>10h00</td>
<td>COFFEE</td>
</tr>
<tr>
<td>10h15</td>
<td><strong>Computer Languages I.</strong> Chairman: G. Wiechers.</td>
</tr>
<tr>
<td>10h35</td>
<td>S. Berman, University of Cape Town. SPS-Algol: Semantic Constructs for a Persistent Programming Language.</td>
</tr>
<tr>
<td>10h50</td>
<td>A. Watson, University of the Witwatersrand. Petri Net Topologies for a Specification Language.</td>
</tr>
<tr>
<td>11h25</td>
<td>A. Mori, University of Cape Town. Towards a Programming Environment Standard in USP.</td>
</tr>
<tr>
<td>11h50</td>
<td>J. Bishop, University of the Witwatersand. ADA for Multiprocessors: Some Problems and Solutions.</td>
</tr>
<tr>
<td>12h30</td>
<td>LUNCH</td>
</tr>
</tbody>
</table>

**Computer Graphics.**
Chairman: D. Hourie

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>14h00</td>
<td>C. F. Scheepers, CSIR. Polygon Shading on Vector Type Devices.</td>
</tr>
<tr>
<td>15h15</td>
<td>COFFEE</td>
</tr>
</tbody>
</table>

**Database Systems I.**
Chairman: B. von Solms.

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>15h30</td>
<td>M.E. Orlowska, UNISA. On Syntax and Semantics Related to Incomplete Information Databases.</td>
</tr>
<tr>
<td>16h05</td>
<td>M.H. Rennenbachkamp, Stellenbosch University. Modelling Distributed Database Concurrency Control Overheads</td>
</tr>
<tr>
<td>18h00</td>
<td>Cocktail Party in Cullinan Room A.</td>
</tr>
</tbody>
</table>

**Operating Systems.**
Chairman: K. MacGregor.

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M. Morris, UNISA. The Development of a Fault Tolerant System for a Real-time Environment.</td>
</tr>
</tbody>
</table>

**Computer Languages II.**
Chairman: J. Bishop.

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W. van Biljon, CSIR. A Generalised Expression Structure.</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>08h30</td>
<td>Keynote Address by Professor Niklaus Wirth, Swiss Federal Institute</td>
</tr>
<tr>
<td></td>
<td>for Technology, Zurich.</td>
</tr>
<tr>
<td></td>
<td><strong>An Extensible System and a Programming Tool for</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Workstation Computers.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Computer Networks and Protocols I.</strong> Chairman: P.S. Kritzinger.</td>
</tr>
<tr>
<td>09h30</td>
<td>A.E. Krzesinski, University of Stellenbosch.</td>
</tr>
<tr>
<td></td>
<td><strong>An Approximate Solution Method for Multiclass Queueing Networks</strong></td>
</tr>
<tr>
<td></td>
<td>with State Dependent Routing and Window Flow Control.</td>
</tr>
<tr>
<td>10h05</td>
<td>J. Punt, University of Cape Town.</td>
</tr>
<tr>
<td></td>
<td><strong>A Protocol Validation System.</strong></td>
</tr>
<tr>
<td>10h30</td>
<td><strong>COFFEE</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Computer Networks and Protocols II.</strong> Chairman: A. van der Heever.</td>
</tr>
<tr>
<td>11h00</td>
<td>P.S. Kritzinger, University of Cape Town.</td>
</tr>
<tr>
<td></td>
<td><strong>Protocol Performance using Image Protocols.</strong></td>
</tr>
<tr>
<td>11h35</td>
<td>Invited Lecture by Professor G. Lasker, University of Windsor, Ontario.</td>
</tr>
<tr>
<td></td>
<td><strong>The Relationship of Natural and Artificial Intelligence.</strong></td>
</tr>
<tr>
<td>12h30</td>
<td><strong>LUNCH</strong></td>
</tr>
<tr>
<td>14h00</td>
<td><strong>Artificial Intelligence.</strong></td>
</tr>
<tr>
<td></td>
<td>Chairman: G. Lasker.</td>
</tr>
<tr>
<td>14h35</td>
<td>A. Cooper, CSIR</td>
</tr>
<tr>
<td></td>
<td><strong>A Data Structure for Exchanging Geographic Information.</strong></td>
</tr>
<tr>
<td>15h15</td>
<td><strong>COFFEE</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Database Systems II.</strong></td>
</tr>
<tr>
<td></td>
<td>Chairman: C. Bornman.</td>
</tr>
<tr>
<td>15h30</td>
<td>M.J. Phillips, CSIR</td>
</tr>
<tr>
<td></td>
<td><strong>An Approach to Direct End-user Usage of Multiple Databases.</strong></td>
</tr>
<tr>
<td>16h05</td>
<td>S. Berman, University of Cape Town.</td>
</tr>
<tr>
<td></td>
<td><strong>A Semantic Data Model Approach to Logical Data Independence.</strong></td>
</tr>
<tr>
<td>16h45</td>
<td>Open Forum with professors G. Lasker, D. Teichrow and N. Wirth.</td>
</tr>
<tr>
<td></td>
<td>Moderator: Dr. D. Jacobson.</td>
</tr>
<tr>
<td>19h30</td>
<td>Symposium Banquet in Cullinan Room.</td>
</tr>
<tr>
<td></td>
<td>Guest speaker, Dr. D. Jacobson., Group Executive: Technology, Allied</td>
</tr>
<tr>
<td></td>
<td>Technologies Limited.</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
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</tr>
<tr>
<td>08h00</td>
<td>Registration (Tutorial only).</td>
</tr>
</tbody>
</table>
| 08h30 | Tutorial. The Tutorial will be given by professor Niklaus Wirth, Division of Computer Science, Swiss Federal Institute of Technology, Zurich. *The use of Modula-2 in Software Engineering.* Topics to be covered include:  
What is Software Engineering?  
Data types and structures.  
Modularization and information hiding.  
Definition and implementation parts.  
Separate compilation with type checking.  
Facilities to express concurrency.  
Pompous programming style.  
What could be excluded? |
| 12h15 | Close of Symposium. |
| 12h30 | LUNCH |
AN APPROACH TO DIRECT END-USER USAGE OF MULTIPLE DATABASES

M J Philips
S A Data Centre for Oceanography
National Research Institute for Oceanology
Stellenbosch

ABSTRACT

The difficulties encountered by users without experience of the use of multiple databases are described, as well as an approach which allows such users to make worthwhile use of these systems, encompassing potentially complex-structure databases. Both the extraction of raw data as contained in the databases, and the obtaining of information derived from the data after processing by application software, are dealt with.

The methods described are based on an architecture which could be implemented using any query language, and usual utilities, together with a data dictionary rich in semantic information about the databases in question.
AN APPROACH TO DIRECT END-USER USAGE OF MULTIPLE DATABASES

1. OVERVIEW

The subject of this paper has been raised by experiences at the South African Data Centre for Oceanography (SADCO), based at the Council for Scientific and Industrial Research's National Research Institute for Oceanology. The task of SADCO has been largely the archiving, and making available for subsequent research work, data collected from various projects concerning the marine environment. In order to maximize the benefits from this endeavour, the computer system employed is accessible via the CSIR's network, so that virtually anyone with an asynchronous terminal, or a microcomputer with such emulation software, is able to use the data system.

The user community is diverse, both in terms of computing equipment, software familiarity, general computing experience, as well as organizational affiliation. As a result of these factors, the data centre is considered to be, in James Martin's characterization, an Information System-type environment, as opposed to an Application database (where the primary consideration is one particular application), or a Subject database (where multiple applications are supported based on common data, and intended for high volume production runs) (Martin, 1983). The information-system environment caters more specifically for efficient and ad hoc searching and data retrieval than either of the other types.

Studies of end-users of computing power, generally in the business environment, have shown that those who are not professional programmers tend to either use the system at a 'command level', by means of 'canned' procedures and reports, or use software to develop their own applications. Previous computer experience has been shown to promote the independent development of applications, although as demand to do so increased, such experience became less important (Kasper and Cerveny, 1985). In respect of this example, some users can be expected to have some computing experience, although this is not generally the case, especially when others, that is, assistants, are expected to carry out the task. Furthermore, the demand to use the system need not be persistent, thereby losing the pressure to perform more involved work over a period of time. Also, in the study mentioned, the methods used can be considered essential tools to the managers concerned, and time was invested in studying manuals, etc. For infrequent users, the study of extensive manuals may cause the complete ignoring of the system.

2. POPULAR SOFTWARE CHARACTERIZATION

2.1 DBMS/IR Systems

Generalized database management systems (DBMS's) and information retrieval systems (IR) provide for different requirements, mainly the degree of data structure involved. IR's usually cater for a simple data environment, commonly present naturally in 3rd normal form, or at least in 1NF, that is, without repeating groups. DBMS's, however, use either the hierarchical, network, or relational model of data structure, and may implement complicated pointers between record types, or other means to allow for
execution of the relational 'join' operator (Togasi and Tanaka, 1982). IR's generally have been designed around specific applications, and are not generally available for diverse use. These factors have an impact on the data manipulation languages (DML) available, and their complexity.

2.2 4th Generation Languages

Data languages usually available with database management systems allow powerful facilities for retrieving, modifying, and otherwise manipulating data stored in databases. Generally, with an intention for their use by non-programmers, non-procedural methods of obtaining data are available, implying that only the requirements, in terms of data names, etc., are specified, and not the means of obtaining it. Also, looping where required is implicit, and is not required to be stated. Procedurality can certainly be an asset in a 4th generation language (4GL), allowing a more powerful tool in the hands of experienced users.

The data languages cannot be expected to be aware of file organization details such as which elements are defined as keys, and this knowledge therefore is assumed of the user. Indeed, all details of the database being read, including all data element names, file names (if necessary), etc., are not automatically available to the data language.

Database navigation is not always automatic, in the sense that two or more relations may be joined in multiple ways, perhaps with intermediate relations as well, and the data language cannot make a decision which to use. The user must therefore make an intentional decision which to use, and in some cases define the join fields.

Finally, since 4th generation languages have largely been considered an extension to the principle of conventional languages (hence their name), the metalanguage used in their description can often be such that non-programmer users are uneasy with it, especially when different names are used for familiar concepts, for example, SEGMENTS, AREAS, etc. for 'files'.

These views have been borne out by our experiences where the use of a query language has not become widespread amongst users, apart from those whose task is primarily data processing. A survey of end-user computing in the business environment (Rockart and Flannery, 1983) tends to support these views also, where it is suggested that non-programming end-users are in the majority, and who use software provided by others, usually through menus, or a strict set of procedures.

3. NATURE OF THE REQUIRED USER INTERFACE

Some debate has occurred regarding the suitability of natural language, for example, English, systems for the use of casual users. The argument is that they would not have to learn any artificial language at all, but investigation has shown that a structured approach assists in the user's clarification of problems, and would be preferable to a wordy and time-consuming dialogue (Schneiderman, 1981). Furthermore, users may not know even where to begin asking questions in an unstructured environment. Codd implemented a system for understanding a restricted
English (Codd, 1974), but pointed out that in itself, this required the users to become accustomed to the restrictions. In this system, he described seven steps which he considered necessary; the use of a simple data model, a high level target language into which the query must be transformed, the existence of a means to clarify the requirements, a confirmation of the system's understanding of the query, and a database search only after full query formulation. In addition to these, further principles he used were a multiple-choice type of interrogation, and a facility for definitions relating to the database. As a result of these factors, and also for extra overheads involved in the system attempting to interpret natural language, a menu-driven type of interface is considered to be most suitable. Additional advantages are that fewer keystrokes are required, and therefore is more attractive to those unaccustomed to typing text on a keyboard (Walton, 1986).

It has been suggested that the user interface must act as both a link (to provide the required facilities), and a barrier (to protect the user from other facets of the system) (Eason, 1976).

A general requirement, and which could be considered a minimum, is that no questions be asked of the user which he does not understand immediately, and to which he cannot reply. Furthermore, the degree of initiative required of the user must be limited to the absolute minimum.

3.1 Generalized Data Retrieval

For generalized data retrieval, the specific problems to be overcome include database element names and data types, user view names, access path names and implications, and other difficulties. Once these problems have been overcome, the way is open to enable users to use multiple databases without specific knowledge of them.

3.2 Integrated Applications Software

The use of 'canned' procedures is common by end-users. In this respect, the data centre has available certain applications software allowing for data reduction of a nature relevant to the available data and other related sciences. Generally, such software does not utilize any database language interface, relying entirely on suitably-formatted data files as extracted from databases. In order to allow end-users to use these systems directly, both the query to the database (in order to prepare the data file), and the parameters controlling the application software, are tailored by the user through the use of a question-answer session. This approach allows for certain variability in the data retrieved, and in the analysis of that data.

4. DATA DICTIONARY

Central to a data system such as outlined, is a suitable data dictionary. At the outset, such a tool was devised and implemented, in fact long before it's full potential was realized, and was described by Hunter (1984). However, increasing requirements have resulted in an expanded system, which now caters for the documentation of keys to the various files,
User view (name, description)

File (name, description, internal name, key)

Item (name, relationship name, ordinal, file name, description, units, storage description, lower limit, upper limit, key status, alias)

File-user view (file name, user view name)

Relationship (name, description)

File-relationship (file name, relationship name, ordinal, join fields)
access paths used in the querying of the databases, the nature of the data stored as elements of the databases, and other features. The requirements of the problem necessitated a network or relational data model because of the relationships present.

Figure 1 shows the structure of the data dictionary database, together with the attributes of the objects.

5. USER SUBSYSTEM AS IMPLEMENTED AT SADCO

5.1 Integrated Applications

I shall first deal with that part of the User subsystem which allows for the running of application software on extracted data, since historically it preceded the higher level database access system.

Figure 2 demonstrates the overall structure of the User subsystem.

Main menu level. This allows for the choice of individual products as listed (according to user choice) by discipline or type of product, or a dynamic up-to-date summary of the products available.

Product level. Each entity at this level applies to a particular product available for end-user usage. Most are intended for users without experience of the databases in question, of database technology in general or, indeed, of computing as such.

Individual runs of the products, by their nature, require different values to be incorporated in the various control files.

Figure 3 is a data flow diagram showing the method of product execution.

In the description of the general product system architecture no reference is made to the means of implementing the modules and any suitable operating system with the usual utilities can be used to implement such a user-friendly interface.

The maintenance of the products subsystem could benefit from a degree of automation, in the sense that it would be easier to control and that errors would be minimized.

The process of adding new product entities at the high-level product subsystem menus should be automated. However, this is not straightforward because the disciplines involved and the nature of the products are important in order to determine in which high-level menu they are to be incorporated. Also, the long-term maintenance of the system will involve the re-organization of these menus and this could have a severe impact on such an automated system.

Links to the data dictionary could be extended, both in the phase of building the product subsystem (a data centre activity) and in product execution (an end-user function).
FIG 2
PRODUCT EXECUTION SYSTEM

MAIN MENU

OTHER SADCO SERVICES
PRODUCTS BY DISCIPLINE
DATA BASE CONTENTS SUMMARIES
PRODUCTS BY TYPE
RAW DATA RETRIEVAL

DISCIPLINE A PRODUCTS
DISCIPLINE B PRODUCTS
DISCIPLINE C PRODUCTS
TYPE A PRODUCTS
TYPE B PRODUCTS
TYPE C PRODUCTS

PRODUCT X

PRODUCT DESCRIPTION
NEW DATA RETRIEVAL AND ANALYSIS INTERACTIVE BATCH
OLD RETRIEVED DATA ANALYSIS INTERACTIVE BATCH

MODULE A (DATA RETRIEVED)
MODULE C (DIRECTIVE FILE)
EXECUTION

INTERACTIVE
BATCH
FIG 3

Data retrieval requirements

Job requirements

Processing requirements

Message during preparation

System 'Dayfile'

Retrieved data file

Product output (Graphics and/or text)

Product subsystem
1.1 Set up retrieval (QU input file)

1.2 Set up required software and device-dependent libraries

1.3 Set up input file for analysis software

1.4 Processing of retrieval, and analysis

- Message during preparation
- System 'Dayfile'
- Retrieved data file
- Product output (graphics and/or text)

Data retrieval requirements

Job requirements (batch/interactive)

Library set

Processing requirements

QU input file

Analyze directives
1.4 (Interactive processing)

1.4.1 Set up file for data
Execute retrieval run

1.4.2 Prepare for software execution (get relocatables if necessary)

1.4.3 Prepare file of analysis directives

1.4.4 Prepare for library set (Computation, & device-dependent libraries)

1.4.5 Software execution

Analysis directives

Retrieved data file

Library set

Message during preparation
System 'Dayfile'
Retrieved data file
Product output (graphics and/or text)
1.4 (Batch processing)

1.4.11 Communicate QU input file to batch run

1.4.12 Software execution/
Message for user about resulting files

1.4.13 Arrange unique naming of all resulting files /
Arrange for library set (computation, &
device-dependent libraries)

1.4.14 Communicate analysis directives files to batch run

Job requirements (naming the run)

Library set

Analysis directives files

Message from preparation

System 'Dayfile'

Retrieved data file

Product output (graphics and/or text)
The extraction of the data, by means of user selection, is limited at present to the query language input as coded at the time of setting up the product. In the course of time it is considered essential to allow the user a flexible means of data selection.

The value of this products subsystem has been demonstrated through the use of data and applications incorporated in it, in some cases by computer-novices and in many other cases by those who are unfamiliar with the structure of the databases and/or the many detailed statements required by the operating system.

5.2 Generalized Data Retrieval

As has been outlined above, some features of a particular database may be foreign to users and could be misinterpreted. These may include:

- database architecture (hierarchical/network/relational)
- element naming
- access paths (names and implications)
- efficient searching methods.

Furthermore, an information system may be distributed over several databases, each with its own difficulties.

Regular changes required for databases such as these, together with the above problems, make it virtually impossible for users to keep up with the latest changes.

Certain combinations of database structure and query languages can create difficulties for users not fully familiar with both.

(a) Efficient searching by means of keys. This includes a knowledge of the keys defined for the database view and also how the query language handles searches by means of keys (for example, inability to process two or more keys together efficiently). Also, creating efficient query programs may require a fairly in-depth knowledge of the query language concerned, and details of the database being searched.

(b) Access paths. The query language may not perform automatic navigation, requiring the user to choose between alternatives which he may not fully understand.

The general requirements placed on a system in an attempt to overcome some of these difficulties include the following:

(a) the user must be required to supply the absolute minimum of information for the desired output, such as that related to the nature of the data he requires and other details such as security restrictions, etc.;

(b) the minimum initiative must be required on the part of the user, that is, as far as is possible the user must be able to make choices from understandable alternatives presented to him;
(c) confirmation of certain input may be desirable;

(d) users with different levels of ability with the database/query language should preferably be accommodated to ensure that the interaction is time-effective;

(e) the system must be based on a data dictionary;

(f) the system must be database-independent;

(g) help should be available on demand for further explanations etc. and for giving the units and/or examples of database elements, and

(h) the system must be able to be used for different query languages.

In the light of the requirements of the user, as described above, it was decided to use a menu-driven approach as far as possible. Consequently, the alternatives available to the user at all levels (database, access path, keys, etc.) are presented as menus from which a choice (in some cases many choices) may be made. These menus are totally dynamic in that they are data-driven in virtually all cases.

The structure of the program providing this interface is shown in Figure 4.

The nature and contents of the data dictionary as described in Section 4 are essential to the functioning of this system. The use of the data dictionary also ensures that all updates to any database covered by the system are included in the user's usage of the database, without his even being aware of them.

**Data dictionary information required**

(a) 'View's' (subschemas)

Any database is usually defined in a one or more subschemas or 'user views'. These declare which database files are to be included, their keys, elements, etc., the access paths (or relations) connecting the said files, security considerations, etc. A user may have a choice of these to access various databases or parts of databases.

(b) Access paths

Various access paths (relations) may be defined or may be navigable in certain sequences to reach certain files of databases. Often such navigation is not automated because a selection between these paths is at the user's discretion, which is made possible by the documentation of such assess paths in the data dictionary.

(c) Keys

Various keys may be defined to allow directly addressable files to be searched efficiently by removing the necessity for sequentially reading all the records and for this reason it is preferable to use these facilities wherever possible. Some query
Read subjects (database views) (READDSP)

Prepare database selection

Database elements retrieval

Help 1 (general explanations)

Help 2 (element units)

HELP 3 (example values)
Choose subject (database views)

Prepare a range of access paths and choose from it

Choose search keys and values

Read database elements

Choose other search elements and values

Generate query language selection statements

Generate query language (database access)

Generate query language (access path and key values)

Generate query language (element values)

GENPCK3

SETVAL1

SCHTRY

PICK1SQ
Choose element for retrieval

Generate query language (label output)

GENPCK3

SCHTRY

Choose elements for sorting

Generate query language (label for sorting)

Generate query language output statement

Database elements retrieval
languages do not allow the use of multiple keys. The program, therefore, must have knowledge of the keys to ensure that at most one may be used.

(d) Elements

The elements defined in a particular user view must be known to the program so that the user can decide which to use for data selection purposes and for data retrieval.

(e) Element types

The nature of the elements must be known to the program so that when conditions are specified in the query language they may be correct for numeric or character items.

(f) Element units

The units which are used to express values are listed in outputs available from the data dictionary and accessible to all users, but it is also convenient to be able to examine these at the time of data selection. For this purpose the program must be supplied with these details so that they may be given to the user on demand.

(g) Element values (lower/upper bounds)

As in the case of the element units the values assigned to the elements may be useful when specifying conditions. Certain of these are, therefore, held by the program for display upon demand by the user.

Passing information from the data dictionary to the program

The required information is made available to the program via what could be called a 'static interface' (Allen, Loomis and Mannino, 1982) using sequential files which are created at times of data dictionary modification, since this method allows faster execution and is independent of data dictionary-program coupling software. An independent report-writer program is used to provide these files.

5.2.3 Query language program synthesis

The query language statements are output to a file for eventual use in processing a database.

5.2.4 Integration in the existing products subsystem

The system components as described here are integrated into the products subsystem in such a fashion that they may be reached by following the set of existing menus and operate by producing query language output that may be modified if necessary by the user before execution against a database. The process of database processing is handled by the products subsystem as for its other applications (Philips, 1984; Philips, 1986b).
5.3 System Utilization

5.3.1 Examples

The following examples show the terminal session under different circumstances and, although fairly lengthy, the input required of the user is minimal.

Simple database (single file, many keys)

Appendix 1 shows a terminal session when a simple database (that is, a single-file database) with many direct access keys, is used. The example is that of the Marine Climatology database at SADCO (Philips, 1986a).

Multi-file database (single access path, single key)

Appendix 2 shows a terminal session using a multi-file database with a single direct access key (the statistical database at SADCO, which holds mean values, etc. for certain parameters included in the main database) (Hunter and Du Plessis, 1985).

Multi-file database (many access paths, many keys).

Appendix 3 shows a terminal session demonstrating most of the features of the system on a complicated database structure (the interdisciplinary SADCO database) with many user views, access paths, keys, etc.

5.3.2 General database structure

As a result of the generalized nature of the data read by the program, as described above, any database structure may be accommodated, whether it be of the hierachical, network or relational models. The only requirements are that the information about the database structure can be represented as discussed, stored in some fashion to allow easy manipulation (on changes to the database) and made available to the program in file structures that can be read conveniently.

5.3.3 Multiple databases

A single implementation of this system can cover many physical databases because it is dependent on the data stored in the data dictionary. This is important in an environment where the stored data are found in different physical databases. Furthermore, there is value in its potential use in other database management groups where various databases may be maintained.

5.4 Query Language and/or Data Dictionary Change

When there is a change of query language or of the system supporting the data dictionary, this system can be modified to make such changes more transparent. Those portions of the program which output the query language statements may be modified so that the target language is another one, allowing the user to use a different system without necessarily being aware of it.
Also, a change in method of maintaining a data dictionary need not have an impact on the program as it does not access the data dictionary directly at all. All that is required is that all the details currently available are retained and that they are presented to the program in a similar fashion.

5.5 Possibilities for Extensions and Improvements to the System

Because the whole system is data dictionary-driven, improvements in the description of database elements, access paths, etc. can be implemented by the content of the data dictionary elements in question. Similarly, this method of accessing a database may easily be extended to any database, given that the database is documented in the data dictionary in the fashion described and that the particular query language in use is catered for by this system.

The concepts as used in this system (data dictionary-driven, menu generation, help and explanation features, etc.) may be used in an extended version, perhaps using full screen mode, in which each menu would be presented on a fresh screen and where choices may be made by positioning the cursor.

A possible useful byproduct of this system could be its capability to act as a tutor in the use of the query language/database combination by informing the user of its actions in addition to providing a query language program as output.

A new implementation of this type of system is in progress, using the 4th level language NATURAL as the target language as well as the language for writing the system. Whilst most of the foregoing factors are also important, extra difficulties exist in using NATURAL, and which can be obviated for the naive user through the use of the interface system. Some of these are:

a) NATURAL programs must be written — there is no interactive select and display capability.
b) Access paths are defined by means of explicit reads on each of the relations stored.
c) Search optimization requires some knowledge of the database and query language.
d) Access paths (also called 'contexts') depend on the roles of the data in the database structure.

6. CONCLUSION

Our experience in the direct use of information system-type database systems by end users, in this case research scientists, has shown that 4th-generation languages, together with various database structures, have not been readily used in practice. This is often a result of the time required to become even partly proficient in the use of the language, difficulties in its use, relative low frequency of its use, details of the many databases, and other factors. The subtleties of database searching may be overlooked, even if the user is fairly familiar with the language, resulting in incorrect results or very inefficient use.
Some criticism has been that the system is frustrating to use and this aspect could enjoy some attention, however, this must be seen in the light of user's questions and doubts being issues precisely which the system is designed to circumvent.

A system such as that described can be a powerful tool which will enable those users who are uncertain of either the query language or the particular database to make effective use of the data stored by a data centre.

7. REFERENCES


APPENDIX 1

1. DESCRIPTION ONLY
2. DATA RETRIEVAL - BATCH EXECUTION
3. DATA RETRIEVAL - INTERACTIVE EXECUTION

SELECT BY NUMBER OR TYPE Q TO QUIT ? 3

DATA REQUIRED IS AS FOLLOWS. PLEASE ENTER IT WHEN ASKED
WHICH DATABASE AND/OR DATABASE VIEW IS REQUIRED
WHICH ACCESS PATH MUST BE USED
WHICH PRIMARY KEYS MUST BE USED FOR SELECTION (AND VALUES)
WHICH OTHER ELEMENTS MUST BE USED FOR SELECTION (AND VALUES)
WHICH ELEMENTS ARE TO BE RETRIEVED
WHICH OF THE ELEMENTS RETRIEVED ARE TO BE USED TO SORT

Enter SSLIB ** USER ACCESS KEY ? XXX

FOR HELP AT MOST STAGES (EXCEPT RESPONSES TO MENUS), TYPE
A "7", IF AUTOMATIC HELP IS AVAILABLE, IT WILL BE DISPLAYED

ARE YOU READY TO START ?
TYPE "GO" AND CARRIAGE RETURN
OR TYPE "NAMES" AND CARRIAGE RETURN IF YOU WANT
TO USE THE ACTUAL DATA NAMES OF THE ELEMENTS
OR TYPE "TEACH" AND CARRIAGE RETURN IF YOU WANT
TO BE SHOWN THE QUERY LANGUAGE STATEMENTS

? Go

PLEASE SELECT THE SUBJECT (DATABASE) OF INTEREST

1) DATA DICTIONARY MARK II
2) PHYSICAL OCEANOGRAPHY AND CHEMISTRY
3) PHYSICAL OCEANOGRAPHY/PLANKTON
4) MARINE CLIMATOLOGY (PRE-1960) (0-50 E)
5) MARINE CLIMATOLOGY (PRE-1960) (30-0 W; 50-70 E)
6) MARINE CLIMATOLOGY (VOS) (0-50 E)
7) MARINE CLIMATOLOGY (VOS) (30-0 W; 50-70 E)
8) ORNITHOLOGY
9) SATELLITE INVENTORY SYSTEM
10) PLANKTON
11) SEDIMENTS-ECOLOGY
12) SEDIMENTS WITH PHYSICAL AND CHEMISTRY
13) STATISTICAL DATABASE
14) TISSUE STUDIES
15) WAVES DATABASE

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WANT TO USE ANY OF THESE

? 6

THE ELEMENT YOU HAVE SELECTED TO USE IS: (MARCLIM
** MARINE CLIMATOLOGY (VOS) (0-50 E)

IS THIS CORRECT (Y/N)? Y

PLEASE SELECT THE STATION IDENTIFICATION REQUIRED

1) STATION IDENTIFICATION (UNIQUE; INTERNAL)
2) LONGITUDE (DEGREES)
3) LATDEG*1000 + LONDEG
4) YEAR IN WHICH RECORDING WAS MADE (DATE)
5) YEAR/MONTH (DATE)

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WANT TO USE ANY OF THESE

? 5

THE ELEMENT YOU HAVE SELECTED TO USE IS: (YRMON
** YEAR/MONTH (DATE)

IS THIS CORRECT (Y/N)? Y

ENTER LOWER VALUE FOR YRMON

? ?

YOU MAY ENTER THE LOWER VALUE FOR THIS PARAMETER FOR WHICH
DATA RECORDS ARE TO BE RETRIEVED
N.B. A EXACT ZERO VALUE IMPLIES NO READING TAKEN

FOR DETAILS OF EXAMPLE VALUES, TYPE "?EG"
FOR DETAILS OF UNITS USED, TYPE "?UNITS"

ENTER LOWER VALUE FOR YRMON

? ?

"?EG"
Selection of non-keys for SELECT and their value

Selection of elements for PROJECT

EXAMPLES OF YRMON

(LOWER BOUND VALUE) IS 1
(UPPER BOUND VALUE) IS 999999
ENTER LOWER VALUE FOR YRMON
? 197910
ENTER GREATER VALUE FOR YRMON
? 197912

DO YOU WANT TO CHOOSE OTHER VALUES FOR DATA RECORD IDENTIFICATION (Y/N)
? Y

PLEASE CHOOSE THE ELEMENTS REQUIRED FOR DATA SELECTION
PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT OR A "*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

TEMPERATURE

1) DEWPOINT TEMPERATURE
2) DRY BULB THERMOMETER TEMP. (AIR TEMP)
3) SURFACE WATER TEMPERATURE
4) INDICATOR FOR TYPE OF SEA SURFACE TEMP. MEASUREMENT
5) WET BULB THERMOMETER TEMP
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE OR 999 TO GET THE ENTIRE LIST
? 2
THE ELEMENT YOU HAVE SELECTED TO USE IS: (DRYBLB ** DRY BULB THERMOMETER TEMP. (AIR TEMP)
IS THIS CORRECT (Y/N)
? Y
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE OR 999 TO GET THE ENTIRE LIST
? 0
PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT OR A "*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS
? -
ENTER LOWER VALUE FOR DRYBLB
? ?EG
EXAMPLES OF DRYBLB

(LOWER BOUND VALUE) IS -99.9
(UPPER BOUND VALUE) IS 99.9
ENTER LOWER VALUE FOR DRYBLB
? -5
ENTER GREATER VALUE FOR DRYBLB
? ?

PLEASE SELECT ELEMENTS TO BE RETRIEVED
PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT OR A "*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

DEGREE

1) LATITUDE (DEGREES)
2) LONGITUDE (DEGREES)
3) LATDEG*1000 + LONDEG
4) LATDEG/LONDEG
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE OR 999 TO GET THE ENTIRE LIST
? 1
THE ELEMENT YOU HAVE SELECTED TO USE IS: (LATDEG ** LATITUDE (DEGREES)
IS THIS CORRECT (Y/N)
? Y
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
** LATITUDE (DEGREES)
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE OR 999 TO GET THE ENTIRE LIST
? 2
THE ELEMENT YOU HAVE SELECTED TO USE IS: (LONDEG ** LONGITUDE (DEGREES)
IS THIS CORRECT (Y/N)
Enter the number from the menu as required, or a zero (0) if you do not wish to use any of these or 999 to get the entire list

0

Please enter a part of the name of the element you want or a "*" for the full list or a "." to leave selecting elements

? DATE

1) Quadrant/Position/Datum/Time
2) Data Set Identifier
3) Year/Month/Day (DATE)
4) Day in which wave recording was made (DATE)
5) Month in which recording was made (DATE)
6) Year in which recording was made (DATE)
7) Year/Month (DATE)

Enter the number from the menu as required, or a zero (0) if you do not wish to use any of these or 999 to get the entire list

? 3

The element you have selected to use is: (DATE)

** Year/Month/Day (DATE)

Is this correct (Y/N)?

? Y

Enter the number from the menu as required, or a zero (0) if you do not wish to use any of these or 999 to get the entire list

? 0

Please enter a part of the name of the element you want or a "*" for the full list or a "." to leave selecting elements

? TEMPERATURE

1) Dewpoint Temperature
2) Dry Bulb Thermometer Temp. (Air Temp)
3) Surface Water Temperature
4) Indicator for type of sea surface temp. measurement
5) Wet Bulb Thermometer Temp

Enter the number from the menu as required, or a zero (0) if you do not wish to use any of these or 999 to get the entire list

? 3

The element you have selected to use is: (DEWPOINT)

** Dewpoint Temperature

Is this correct (Y/N)?

? Y

Enter the number from the menu as required, or a zero (0) if you do not wish to use any of these or 999 to get the entire list

? 3

The element you have selected to use is: (SRFTMP)

** Surface Water Temperature

Is this correct (Y/N)?

? Y

Enter the number from the menu as required, or a zero (0) if you do not wish to use any of these or 999 to get the entire list

? 0

Please enter a part of the name of the element you want or a "*" for the full list or a "." to leave selecting elements

**************************************************************************************

Is a sort required (Y/N)?

? N

Enter R.U.N ID: ** Identification of this datafile (3 Alphameric)

Enter R.U.N ID: ** Identification of this datafile. (3 Alphameric)

Data Retrieval in progress
APPENDIX 2

1. DESCRIPTION ONLY
2. DATA RETRIEVAL - BATCH EXECUTION
3. DATA RETRIEVAL - INTERACTIVE EXECUTION

SELECT BY NUMBER OR TYPE Q TO QUIT

DATA REQUIRED IS AS FOLLOWS, PLEASE ENTER IT WHEN ASKED
WHICH DATABASE AND/OR DATABASE VIEW IS REQUIRED
WHICH ACCESS PATH MUST BE USED
WHICH PRIMARY KEYS MUST BE USED FOR SELECTION (AND VALUES)
WHICH OTHER ELEMENTS MUST BE USED FOR SELECTION (AND VALUES)
WHICH ELEMENTS ARE TO BE RETRIEVED
WHICH OF THE ELEMENTS RETRIEVED ARE TO BE USED TO SORT

Enter SSLIB ** USER ACCESS KEY ? XXX
************************************************************************************
A "T", IF AUTOMATIC HELP IS AVAILABLE, IT WILL BE DISPLAYED
************************************************************************************

ARE YOU READY TO START?
TYPE "GO" AND CARRIAGE RETURN
OR TYPE "NAMES" AND CARRIAGE RETURN IF YOU WANT
TO USE THE ACTUAL DATA NAMES OF THE ELEMENTS
OR TYPE "TEACH" AND CARRIAGE RETURN IF YOU WANT
TO BE SHOWN THE QUERY LANGUAGE STATEMENTS

GO

PLEASE SELECT THE SUBJECT (DATABASE) OF INTEREST

1) DATA DICTIONARY MARK II
2) PHYSICAL OCEANOGRAPHY AND CHEMISTRY
3) PHYSICAL OCEANOGRAPHY / PLANKTON
4) MARINE CLIMATOLOGY (PRE-1960) (0-50 E)
5) MARINE CLIMATOLOGY (PRE-1960) (30 - 0 W; 50 - 70 E)
6) MARINE CLIMATOLOGY (VOS) (0-50 E)
7) MARINE CLIMATOLOGY (VOS) (30 - 0 W; 50 - 70 E)
8) ORNITHOLOGY
9) SATELLITE INVENTORY SYSTEM
10) PLANKTON
11) SEDIMENTS - ECOLOGY
12) SEDIMENTS WITH PHYSICAL AND CHEMISTRY
13) STATISTICAL DATABASE
14) TISSUE STUDIES
15) WAVES DATABASE

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE

THE ELEMENT YOU HAVE SELECTED TO USE IS: (STATS ** STATISTICAL DATABASE IS THIS CORRECT (Y/N)?

PLEASE SELECT THE STATION IDENTIFICATION REQUIRED

THE ELEMENT YOU HAVE SELECTED TO USE IS: (STATID ** HOLDS ONEDEG,QUADRANT,SEASNO AND DEPNO IS THIS CORRECT (Y/N)?

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT
OR A "•" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

PLEASE NOTE THAT YOUR SEARCH WILL BE SEQUENTIAL
--- VERY SLOW ---

DO YOU WANT TO CHOOSE OTHER STATION IDENTIFICATION SUCH AS POSITION IN MINUTES, MONTH, ETC (Y/N)?

PLEASE SELECT THE ELEMENTS REQUIRED FOR DATA SELECTION

THE ELEMENT YOU HAVE SELECTED TO USE IS: (ONEDEG ** LAT(2)-LONG(3) LH TOP CORNER OF SO IS THIS CORRECT (Y/N)?

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT
OR A "•" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

ENTER THE MIN (NORTHERN) AND MAX (SOUTHERN) LATITUDE DEGREES

? 20
? 25
SELECTION OF ELEMENTS FOR PROJECT

ENTER THE WESTERN AND EASTERN LONGITUDE LIMITS AS FOLLOWS:
WESTERN LONGITUDE DEGREE
12
QUADRANT (W/E)
E
EASTERN LONGITUDE DEGREE
16
QUADRANT (W/E)
E

******************************************************************************
DO YOU WANT TO CHOOSE ANY OTHER IDENTIFICATION SUCH AS ELEMENT VALUES ETC (Y/N)
N
******************************************************************************

PLEASE SELECT ELEMENTS TO BE RETRIEVED
PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT OR A "*" FOR THE FULL LIST OR A "." TO LEAVE SELECTING ELEMENTS

DEPTH
1) GIVES DEPTH NUMBER-REPRESENTS DEPTH RANG
2) MIDDLE DEPTH FOR DEPTH RANGE
3) HOLDS ONEDEG,QUADRANT,SEASNO AND DEPNO
4) MEAN TEMP IN 1 DEG.SEAS.DEPTH

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE OR 999 TO GET THE ENTIRE LIST

THE ELEMENT YOU HAVE SELECTED TO USE IS: (DEPTH
** MIDDLE DEPTH FOR DEPTH RANGE
IS THIS CORRECT (Y/N)
Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (SAL-N
** SAL NO OF READINGS(SEE TMP-N)
IS THIS CORRECT (Y/N)
Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (SAL-S
** SAL STANDARD DEV.
IS THIS CORRECT (Y/N)
Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (SAL-I
** SAL NO OF READINGS(SEE TMP-N)
IS THIS CORRECT (Y/N)
Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (SAL-U
** SAL MEAN
IS THIS CORRECT (Y/N)
Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (SAL-U
** SAL MEAN
IS THIS CORRECT (Y/N)
Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (SAL-L
** SAL MEAN
IS THIS CORRECT (Y/N)
Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (LAT-2)
** LAT(2)-LONG(3) LH TOP CORNER OF SQ
IS THIS CORRECT (Y/N)
Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (ΟΝΕ ΔΕΘ)
** LAT(2)-LONG(3) LH TOP CORNER OF SQ
IS THIS CORRECT (Y/N)
Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (ΟΝΕ ΔΕΘ)
** LAT(2)-LONG(3) LH TOP CORNER OF SQ
IS THIS CORRECT (Y/N)
Y

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT OR A "*" FOR THE FULL LIST OR A "." TO LEAVE SELECTING ELEMENTS

LATITUDE

THE ELEMENT YOU HAVE SELECTED TO USE IS: (ΟΝΕ ΔΕΘ)
** LAT(2)-LONG(3) LH TOP CORNER OF SQ
IS THIS CORRECT (Y/N)
Y

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT OR A "*" FOR THE FULL LIST OR A "." TO LEAVE SELECTING ELEMENTS

Selection of sort elements

**IS A SORT REQUIRED (Y/N)**

? Y

1) MIDDLE DEPTH FOR DEPTH RANGE
2) SAL MEAN
3) SAL NO OF READINGS (SEE TMP-N)
4) SAL STANDARD DEV.
5) LAT(2)-LONG(3) LH TOP CORNER OF SQ

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE

? 5

THE ELEMENT YOU HAVE SELECTED TO USE IS: (ONE DEG)
** LAT(2)-LONG(3) LH TOP CORNER OF SQ**

IS THIS CORRECT (Y/N)

? Y

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE

? 1

THE ELEMENT YOU HAVE SELECTED TO USE IS: (DEPTH)
** MIDDLE DEPTH FOR DEPTH RANGE**

IS THIS CORRECT (Y/N)

? Y

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE

? 0

Enter MUST OU BE ALTERED (Y/N) (UNDERSTANDING OF DATABASE REQD.)? N
Enter RUNID ** IDENTIFICATION OF THIS DATAFILE (3 ALPHANUMERIC)? EX

DATA RETRIEVAL IN PROGRESS
1. DESCRIPTION ONLY
2. DATA RETRIEVAL - BATCH EXECUTION
3. DATA RETRIEVAL - INTERACTIVE EXECUTION

SELECT BY NUMBER OR TYPE Q TO QUIT

DATA REQUIRED IS AS FOLLOWS, PLEASE ENTER IT WHEN ASKED
WHICH DATABASE AND/OR DATABASE VIEW IS REQUIRED
WHICH ACCESS PATH MUST BE USED
WHICH PRIMARY KEYS MUST BE USED FOR SELECTION (AND VALUES)
WHICH OTHER ELEMENTS MUST BE USED FOR SELECTION (AND VALUES)
WHICH ELEMENTS ARE TO BE RETRIEVED
WHICH OF THE ELEMENTS RETRIEVED ARE TO BE USED TO SORT

Enter SSLIB ** USER ACCESS KEY XXX

FOR HELP AT MOST STAGES (EXCEPT RESPONSES TO MENUS), TYPE "7". IF AUTOMATI C HELP IS AVAILABLE, IT WILL BE Displayed

ARE YOU READY TO START?
TYPE "GO" AND CARRIAGE RETURN
OR TYPE "NAMES" AND CARRIAGE RETURN IF YOU WANT
TO USE THE ACTUAL DATA NAMES OF THE ELEMENTS
OR TYPE "TEACH" AND CARRIAGE RETURN IF YOU WANT
TO BE SHOWN THE QUERY LANGUAGE STATEMENTS

SELECT BY NUMBER OR TYPE Q TO QUIT

THE ELEMENT YOU HAVE SELECTED TO USE IS: <FILL>

PLEASE SELECT THE SUBJECT (DATABASE) OF INTEREST

1) DATA DICTIONARY MARK II
2) PHYSICAL OCEANOGRAPHY AND CHEMISTRY
3) PHYSICAL OCEANOGRAPHY / PLANKTON
4) MARINE CLIMATOLOGY (PRE-1960) (0-50 E)
5) MARINE CLIMATOLOGY (PRE-1960) (30-0 W; 50-70 E)
6) MARINE CLIMATOLOGY (VOS) (0-50 E)
7) MARINE CLIMATOLOGY (VOS) (30-0 W; 50-70 E)
8) ORNITHOLOGY
9) SATELLITE INVENTORY SYSTEM
10) PLANKTON
11) SEDIMENTS - ECOLOGY
12) SEDIMENTS WITH PHYSICAL AND CHEMISTRY
13) STATISTICAL DATABASE
14) TISSUE STUDIES
15) WAVES DATABASE

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE

THE ELEMENT YOU HAVE SELECTED TO USE IS: (FILL)

PLEASE SELECT THE ACCESS PATH (RELATION) REQUIRED

1) PLANKTON WITH WATER TEMPS. ETC AND NUTRIENTS
2) PLANKTON WITH WATER TEMPS. ETC
3) PLANKTON LINKED TO WEATHER, NUTRIENTS

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE

THE ELEMENT YOU HAVE SELECTED TO USE IS: (PLANKTON-FILL)

PLEASE SELECT THE STATION IDENTIFICATION REQUIRED

1) UNIQUE STATION IDENTIFIER (INTERNAL)
2) LONGITUDE (DEGREES)
3) MONTH IN WHICH RECORDING WAS MADE (DATE)
4) COMBINATION LAT/LON
5) YEAR IN WHICH RECORDING WAS MADE (DATE)
6) COMBINATION YEAR/MONTH (DATE)

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE

THE ELEMENT YOU HAVE SELECTED TO USE IS: (YRMON)

YOU MAY ENTER THE LOWER VALUE FOR THIS PARAMETER FOR WHICH
DATA RECORDS ARE TO BE RETRIEVED

N.B. A EXACT ZERO VALUE IMPLIES NO READING TAKEN
Selection of non-keys in 'head' file for SELECT

FOR DETAILS OF EXAMPLE VALUES, TYPE "?EG"
FOR DETAILS OF UNITS USED, TYPE "?UNITS"
ENTER THE UNITS FOR YRMON
? UNITS
THE UNITS FOR YRMON -- YYYYMM
ENTER LOWER VALUE FOR YRMON
? 198006
ENTER GREATER VALUE FOR YRMON
? 198105

DO YOU WANT TO CHOOSE OTHER STATION IDENTIFICATION SUCH AS POSITION IN MINUTES, MONTH, ETC (Y/N)? Y

PLEASE CHOOSE THE ELEMENTS REQUIRED FOR DATA SELECTION
PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT OR A "*" FOR THE FULL LIST OR A "." TO LEAVE SELECTING ELEMENTS

1) NAME OF AREA OF OPS
2) CANADIAN SQUARE. VIRTUAL RESULT.
3) CONTRIBUTOR
4) DAY IN WHICH WAVE RECORDING WAS MADE (DATE)
5) X COMPN. OF SUBSTN
6) Y COMPN. OF SUBSTN
7) E.G. LAGOON, BEACH, DEEP SEA, ETC.
8) USER'S EXPT OR CRUISE NAME
9) LATITUDE (DEGREES)
10) LATITUDE (MINUTES)
11) LONGITUDE (MINUTES)
12) MAXIMUM SAMPLE DEPTH
13) DISTANCE OFF SHORE
14) FLAG TO INDICATE PRESENCE OF NITRATE DATA
15) DATE IN WHICH WAVE RECORDING WAS MADE <DATE>
16) NAME OF PLATFORM
17) NAME OF PLATFORM
18) PLATFORM DESCRIPT. EG SHIP, SATELLITE
19) FLAG TO INDICATE PRESENCE OF PHOSPHORUS DATA
20) USER'S PROJECT NAME
21) EAST/WEST
22) FLAG TO INDICATE PRESENCE OF SALINITY DATA
23) SHIP DRIFT: DIRECTION
24) SHIP DRIFT: SPEED
25) SHIP DRIFT: SPEED
26) FLAG TO INDICATE PRESENCE OF SULPHATE DATA
27) SHIP DRIFT: SPEED
28) STATION START TIME

Please enter the number from the menu as required, or a zero (0) if you do not wish to use any of these.

10) THE ELEMENT YOU HAVE SELECTED TO USE IS: (LATITUDE)

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT OR A "*" FOR THE FULL LIST OR A "." TO LEAVE SELECTING ELEMENTS

1) CHLOROPHYLL-A
2) CHLOROPHYLL-B
3) CHLOROPHYLL-C

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT OR A "*" FOR THE FULL LIST OR A "." TO LEAVE SELECTING ELEMENTS

1) THE ELEMENT YOU HAVE SELECTED TO USE IS: (CHLOROPHYLL)

** CHLOROPHYLL-A
IS THIS CORRECT (Y/N)
Selection of elements for PROJECT

? Y
ENTER THE NUMBER FROM THE MENU AS REQUIRED.
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

? 0
PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT
OR A ".*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

? ENTER LOWER VALUE FOR CHLA UNITS
THE UNITS FOR CHLA ARE: -- UGM PER L
ENTER LOWER VALUE FOR CHLA

? Y
EXAMPLES OF CHLA
(LOWER BOUND VALUE) IS 0.001
(UPPER BOUND VALUE) IS 999.999
ENTER LOWER VALUE FOR CHLA

? 0.001
ENTER GREATER VALUE FOR CHLA

*** TO SELECT ELEMENTS TO BE RETRIEVED ***
PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT
OR A ".*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

? DEGREE
1) LATITUDE (DEGREES)
2) LONGITUDE (DEGREES)
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

? 1
THE ELEMENT YOU HAVE SELECTED TO USE IS: (LATDEG)
** LATITUDE (DEGREES)
IS THIS CORRECT (Y/N)

? Y
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

? 2
THE ELEMENT YOU HAVE SELECTED TO USE IS: (LONDEG)
** LONGITUDE (DEGREES)
IS THIS CORRECT (Y/N)

? Y
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

? 0
PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT
OR A ".*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

? DATE
1) DAY IN WHICH WAVE RECORDING WAS MADE (DATE)
2) MONTH IN WHICH RECORDING WAS MADE (DATE)
3) FLAG TO INDICATE PRESENCE OF NITRATE DATA
4) FLAG TO INDICATE PRESENCE OF PHOSPHORUS DATA
5) FLAG TO INDICATE PRESENCE OF SALINITY DATA
6) FLAG TO INDICATE PRESENCE OF TEMPERATURE DATA
7) YEAR IN WHICH RECORDING WAS MADE (DATE)
8) COMBINATION YEAR/MONTH (DATE)
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

? 7
THE ELEMENT YOU HAVE SELECTED TO USE IS: (YEAR)
** YEAR IN WHICH RECORDING WAS MADE (DATE)
IS THIS CORRECT (Y/N)

? Y
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

? 2
THE ELEMENT YOU HAVE SELECTED TO USE IS: (MONTH)
** MONTH IN WHICH RECORDING WAS MADE (DATE)
IS THIS CORRECT (Y/N)

? Y
ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

? 1
THE ELEMENT YOU HAVE SELECTED TO USE IS: (DATE)
** DAY IN WHICH WAVE RECORDING WAS MADE (DATE)
IS THIS CORRECT (Y/N)

Y

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

Y

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT
OR A "*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

DEPTH

1) DISCRETE DEPTH SAMPLING BIOMASS
2) SAMPLING INSTRUMENT DEPTH
3) MAXIMUM SAMPLE DEPTH
4) DEPTH TO BOTTOM AT SAMPLE POINT
5) NET TOW DEPTH

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (DEPTH)
** SAMPLING INSTRUMENT DEPTH
IS THIS CORRECT (Y/N)

Y

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (DEPTH)
** NET TOW DEPTH
IS THIS CORRECT (Y/N)

Y

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

Y

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT
OR A "*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

CHLOROPHYLL

1) CHLOROPHYLL-A
2) CHLOROPHYLL-B
3) CHLOROPHYLL-C

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (CHLA)
** CHLOROPHYLL-A
IS THIS CORRECT (Y/N)

Y

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

Y

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT
OR A "*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

TEMPERATURE

1) WATER TEMPERATURE
2) TRAWL BOTTOM TEMP(TRAW-BOT-TMP)
3) FLAG TO INDICATE PRESENCE OF TEMPERATURE DATA
4) TRAWL TOP TEMP(TRAW-TOP-TMP)

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (TMP)
** WATER TEMPERATURE
IS THIS CORRECT (Y/N)

Y

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE
OR 999 TO GET THE ENTIRE LIST

Y

THE ELEMENT YOU HAVE SELECTED TO USE IS: (TMTOP)
** TRAWL TOP TEMP(TRAW-TOP-TMP)
IS THIS CORRECT (Y/N)

Y

ENTER THE NUMBER FROM THE MENU AS REQUIRED,
TO SELECT ELEMENTS

PLEASE ENTER A PART OF THE NAME OF THE ELEMENT YOU WANT
OR A "*" FOR THE FULL LIST
OR A "." TO LEAVE SELECTING ELEMENTS

IS A SORT REQUIRED (Y/N)?

1) LATITUDE (DEGREES)
2) LONGITUDE (DEGREES)
3) YEAR IN WHICH RECORDING WAS MADE (DATE)
4) MONTH IN WHICH RECORDING WAS MADE (DATE)
5) DAY IN WHICH WAVE RECORDING WAS MADE (DATE)
6) SAMPLING INSTRUMENT DEPTH
7) NET TOW DEPTH
8) CHLOROPHYLL-A
9) WATER TEMPERATURE
10) TRAWL TOP TEMP (TRAW-TOP-TMP)

ENTER THE NUMBER FROM THE MENU AS REQUIRED, OR A ZERO (0) IF YOU DO NOT WISH TO USE ANY OF THESE

THE ELEMENT YOU HAVE SELECTED TO USE IS: **

IS THIS CORRECT (Y/N)?

1) LATITUDE (DEGREES)

THE ELEMENT YOU HAVE SELECTED TO USE IS: **

IS THIS CORRECT (Y/N)?

1) LONGITUDE (DEGREES)

THE ELEMENT YOU HAVE SELECTED TO USE IS: **

IS THIS CORRECT (Y/N)?

1) LATITUDE (DEGREES)

THE ELEMENT YOU HAVE SELECTED TO USE IS: **

IS THIS CORRECT (Y/N)?

Enter MUST BE ALTERED (Y/N) (UNDERSTANDING OF DATABASE REQ'D.)?

Enter RUNID ** IDENTIFICATION OF THIS DATAFILE (3 ALPHANUMERICS)?

DATA RETRIEVAL IN PROGRESS