UNITED NATIONS ENVIRONMENT PROGRAMME

Needs and Specifications for a Biodiversity Information Network

Proceedings of an International Workshop held at the Tropical Database, Campinas, Brazil, 26-31 July 1992

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PREFACE

This volume records the Proceedings of an international workshop co-sponsored by UNEP, IUBS, IUMS and WFCC to discuss the needs and specifications of a biodiversity information network.

The Proceedings include the workshop recommendations, the programme and background documents, the working group discussions and summaries, prepared contributions from participants that were present in person, additional papers contributed online during the workshop, comments, discussions and a list of participants.

The workshop was attended by some 39 people from a number of international organisations interested in biodiversity. Before, during, and for two weeks after the workshop, the proceedings were made available online through the MSDN Bulletin Board and the list server managed by the Tropical Data Base. Over 200 people accessed these online proceedings and some 40 additional contributions were received and are included in this publication.

The large number of contributors, present and online, has led to the publication of a valuable 'state of the art' document that will be of importance for continuing discussions. The Workshop participants are concerned that this is recognised by readers as a start towards the development of a biodiversity information network. Others are invited to participate with the interim working groups that have been set up to begin the establishment of the network as an international initiative.

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August 1992

CHAPTER 1

1.1 WORKSHOP SUMMARY

A Workshop on the Needs and Specifications for a Biodiversity Information Network held at the Tropical Data Base, Campinas, Brazil, July 26-31, 1992, was attended by 35 people from a number of international organisations. It was made available online through a variety of electronic networks which were accessed by some 200 people, 30 of whom sent contributions to the discussions. The purpose of the Network is to support and encourage protection of the environment and conservation of the genetic resources inherent in its biodiversity. In order to pursue this objective and support the Biodiversity Convention, the Global Biodiversity Strategy and Agenda 21 (Chapters 15 and 40), the following recommendations were agreed. These will be distributed widely so that the biodiversity community has the opportunity to comment and express its interest.

RECOMMENDATIONS

1. There is a need fo a network to facilitate access to all levels of information (from molecular to biosphere) and will combine the knowledge within each discipline, furthering the understanding of biodiversity of living systems. Such an effort should identify and seek to fill the gaps, leading to new research and more informed policy decisions. The initiative will be known as the Biodiversity Information Network 21.

2. The goal is to exchange information by electronic means whenever possible, but to include other ways of communication as needed by the network participants. To achieve a global electronic access, support should be provided to regions where facilities do not exist.

3. It will have be a distributed network that will link many different sources of information across the world and will operate on a not-for-profit basis. Such a design is scientifically, economically and politically practical, allowing effort and resources to be shared.

4. The network will have be open to a wide range of user groups including, but not limited to scientists, teachers, natural resource managers, policy makers, regulatory and legislative agencies and public interest groups. The needs of the user community will be actively sought to enable their requirements to be met more effectively.

5. The network should actively encourage the free exchange of information on a worldwide basis and will also encourage the standardisation of information and methodology.

6. A Secretariat need to be established as a focal point and clearing house to facilitate and coordinate the flow of information among those with an interest in biodiversity.

7. Cooperating groups will have to be established with the purpose of encouraging participation and regional development. Collaboration with existing centres will be encouraged in order to prevent duplication of efforts already underway and to promote efficient use of funds. Support for developing countries to ensure global participation will be an important element.

8. Initially, an interim Steering Committee will have to be set up to coordinate immediate activities and seek funding. It will be supported by a number of Working Groups. These working groups will advise in areas such as: Technical Issues, Outreach, Training and Editorial/Moderating Functions.

9. An initial activity will be to design and develop a Directory of Biodiversity Information Resources, drawing on existing directories. It will be made widely available by all possible means.

10. The involvement and support of governmental and non-governmental organisations and initiatives working within biodiversity will have to be solicited.

1.2 THE BIODIVERSITY INFORMATION NETWORK CALL FOR FURTHER PARTICIPATION

Following the Biodiversity Convention and Agenda 21, an international group considered the establishment of a Biodiversity Information Network to solve the problem of managing global diversity information. The network will disseminate and facilitate access to biodiversity information worldwide. It will encourage the active involvement of all regions of the world. The first mission of the initiative is to ensure participation of the entire biodiversity community.

The Workshop, co-sponsored by the International Union of Biological Sciences, the International Union of Microbiological Societies, the World Federation for Culture Collections and the United Nations Environment Programme, was held at the Tropical Data Base, Campinas, Brazil, July 26-31, 1992. Initial participants included scientists, non-governmental and governmental organisations.

The sustainable management of the environment and conservation of the biodiversity of plants, animals, microorganisms and all living things depends on reliable and readily accessible information. Without information on the names, the location, activity and interactions of organisms in the ecosystem, appropriate policies, conservation strategies or remedial actions cannot succeed.

The amount of information currently in existence and soon to be developed is vast. It is scattered around the world and is not easily obtained. There is a clear need for a network to link these resources and make them readily available. The participants invite the active involvement of all individuals and organisations with an interest in the aims of the network.

The network to be established will be primarily electronic - linking databases and providing a communications system - but will use all other means for distributing information. The network will encourage exchange of data and ensure that the needs of developing countries are met. The information resource will be global and the participation of the developing world will be actively sought.

An interim steering group will provide support for the initiative and seek funding and sponsorship. Working groups have been formed to give technical, educational and administrative support to start the process of establishing the network.

Simultaneously with the workshop online bulletin boards were set up in which several hundred interested people participated. From this it is clear that the initiative is attracting worldwide interest, reflecting the general recognition that information is an essential element in the underpinning of the Rio Convention.

The Workshop was funded by the United Nations Environment Programme, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renovaveis, Programa de Formacao de Recursos Humanos para Areas Estrategicas, Conselho Nacional de Desenvolvimento Cientifico e Tecnologico, Financiadora de Estudos e Projetos and the British Council.

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CHAPTER 2

2.1 INTRODUCTION AND BACKGROUND

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THE PROBLEM

The present interest in environmental protection and conservation and sustainable development, highlighted by the UN Conference on the Environment and Development (Summit Earth) and reflected in numerous meetings and symposia around the world, has alerted the international scientific community to the need to make information on biodiversity readily and universally accessible.

Much information already exists in laboratories, known in the main to the data providers and users in the disciplines concerned, but often unknown to the wider scientific community which may require access to it for the purposes of biodiversity studies.

This situation will remain unchanged without an international, interdisciplinary effort to address the problem.

The information - in books, journals, directories, databases, laboratory notebooks, 'grey literature' - is already vast and will grow at an increasing rate as the scientific biodiversity programmes accelerate and new projects are funded. The number of databases already has reached gigabyte proportions and it is inconceivable that they will ever become harmonised, or integrated into a single resource. They exist and will multiply and - as similar workshops of experts on bioinformatics have found - are only likely to become universally accessible through networking technology. Somehow, these information resources must be linked. The way to do it must be discussed by biology networkers and telecommunications experts.

THE PROPOSAL

At a meeting of microbiologists sponsored by the International Union of Microbiology Societies (IUMS) and the International Union of Biological Sciences (IUBS) held in Amsterdam in September 1991, scientists from the different microbiological disciplines met to consider the priorities for microbial diversity research. During the course of the meeting the subject of collection and dissemination of data was raised and the difficulties were discussed. Representatives of the World Federation for Culture Collections (WFCC) proposed that an international Workshop be arranged to bring together, as a first essential step, the networking people from botany, zoology and microbiology. The purpose of the workshop would be to introduce the different biological networkers to each other and discuss technical opportunities, administrative and economic issues, practical limitations and scientific goals, leading to recommendations for the establishment of a biodiversity network.

The group accepted this proposal and sponsorship by IUBS, IUMS and WFCC was agreed. Subsequently, UNEP also agreed to sponsor the event. The Microbial Strain Data Network (MSDN) and the Tropical Data Base (BDT), as networking organisations in microbiology, agreed to work with the WFCC in organising the workshop and the BDT offered to host the meeting. The

organisers contacted networkers known to them and invited others to help locate interested groups in other disciplines. The response to the proposed workshop has been warm and welcomed with considerable interest.

It is accepted by the organisers that some active networks may not have been contacted through lack of information, but it is anticipated and much hoped that the publicity gained from the workshop and the subsequent publication of the proceedings will attract the attention of other relevant groups who will make contact with the workshop participants afterwards and offer their experience as a contribution to the general debate. An announcement of the workshop on academic networks has aroused great interest and it seems that many remote networkers will follow the workshop online.

THE FORMAT

Written contributions from participants have been requested and these, together with additional information (programme schedule, participants' contact information), will form the background documentation distributed to the participants and made available in the online conference.

The workshop will consist of presentations by the participants, and group discussions on different technical, administrative and economic aspects of developing a network for biodiversity. Time for informal discussions and computer demonstrations will be generous since detailed knowledge of the participants' activities will facilitate good future communication. Simultaneously with the workshop, the MSDN will make available an online computer conference to which summaries of the group discussions will be posted and to which online participants will add their comments. The conclusions and recommendations of the workshop will be posted to the computer conference for wider distribution.

The background documentation, supplemented with the workshop contributions, discussions, conclusions and recommendations will form the published Proceedings of the workshop. These will be in a near-complete form by the end of the workshop and it is hoped that rapid publication and distribution will follow. UNEP have agreed to publish this document, which it is anticipated will form a landmark and reference document for future developments.

MATTERS FOR DISCUSSION DURING THE WORKSHOP

During the workshop, the following issues may be considered by participants with a view to making recommendations for the establishment of a biodiversity information network.

* Networking resources:

An inventory of existing networks known to participants can be initiated and made available in a way that allows general access and ready updating. This inventory could form an online information resource (possibly as a Bulletin Board) so that new initiatives can be posted to form a continually up-dated network inventory. Networks listed will include those participating in the workshop together with others known to them and identified subsequently. Data listed for each network could include subject area, administrative allegiance, telecommunications system used, access route (with telecommunications address(es)), usage limitations (academic only, for fee etc), costs and contact information.

* Technical specifications for an integrated biodiversity network:

The network design and specifications must be considered and models known to the participants should be presented and examined with a view to considering the most suitable architecture to adopt in the first instance. Centralised, decentralised, distributed networks should be reviewed and, for each model, the technical possibilities and limitations should be considered.

Within these discussions, attention should be paid to the political, financial and administrative consequences of the establishment of a network to support the biodiversity programmes in the next decade.

* Links for regions and disciplines; support offices:

The global and multidisciplinary aspects of a biodiversity network suggest the value of establishing either regional centres/linked groups (Latin America, Europe, Asia etc) and/or disciplinary centres/linked groups (plants, animals, microorganisms, viruses, insects, legumes etc). The needs for these can be considered and possible groups identified who could be approached with a view to discussing possibilities. In some cases such initiatives will be already underway.

* Funding:

Funding needs must be addressed and possible funding agencies listed. The structure of future funding must be considered (centralised, regional, national, projects etc). Funding levels will depend on the network design (eg, a decentralised system can spread the costs regionally, by discipline, by region).

Funds will be needed for such network elements as the establishment of gateways, interface development, secretariat support, meetings, telecommunications costs for task groups, promotion and publicity.

* International relationships:

Relationships with the UN, the scientific ICSU groups, the NGOs and other organisations are a key to future support and collaboration. Moreover, since biodiversity activities must be at the international, interdisciplinary level, organisations worldwide must be invited to collaborate and contribute their unique expertise.

* Databases:

The networks will be fed by the databases on biodiversity that already exist or that will be developed in the future in the disciplines of botany, zoology and microbiology and the subsets within these. Again, the start of a biodiversity database inventory can be made by the workshop participants with their specialist knowledge, linking this to other such initiatives that may be underway.

The following are examples of the kinds of information that will form part of the overall resource:

research databases (environmental, ecological, distribution studies), taxonomic databases (names, synonyms), country lists for conservation considerations (species, environmental significance, economic values), sites of special scientific interest/value, ex-situ conservation facilities (zoos, botanical gardens, herbaria, culture collections), regulatory (release, safety, trading, patents), experts (who does what where in biodiversity science, conservation management, administration,

networking, database development), computing (telecommunications, database hosting, gatewaying, software development, interfaces, broadband networks, satellites), services (existing networks offering services, consultancy groups, telecommunications companies), funding (banks, agencies, trusts, government departments, institutes), organisations (UN agencies, international organisations [EEC, OECD, NATO, ICSU], regional/national organisations [ODA, PAHO, FINEP]).

RECOMMENDATIONS AND ACTION ITEMS:

The outcome of the workshop will be recommendations on the needs and technical design of an information network for biodiversity. These can be published and distributed widely for further discussion.

Action items for subsequent follow-up will be agreed and should include a schedule for future activities with an accompanying time frame. The following are possible activities for discussion:

- Establishment of working groups for specialist functions: eg. networking, funding, taxonomic advisory, promotion and publicity, inventories, regional offices/links, disciplinary link groups;

- Establishment of a network coordinating facility (focal point);

- Establishment of communications mechanisms for continuing dialogue;

- Setting up online inventories (of networks, databases);

- Development of a contact database of experts active in the field of biodiversity networking.

CONCLUSIONS

The expected outcome of the workshop is published recommendations on the design for a network for biodiversity. In addition, follow- up action items will be proposed. The organisers believe that both technical developments and global needs will provide the necessary impetus to ensure a positive development in the future.

There are now precedents and groups with experience in establishing quite complex integrated information resources in different disciplines. Many such people will be present at the workshop or will be contributing online, thus adding to the likelihood of success. Lessons have been learned and experience has been gained and there is an apparent strong willingness among groups in different disciplines to discuss how their independent efforts may be linked.

The workload is too great for any single group, the scientific and technical experience is not combined in any single body, the costs are too great for any single organisation to bear. But collectively and with strong organisation and technical support, a biodiversity network can begin to take shape to support the Agenda 21 activities following UNCED. The workshop is a first step.

CHAPTER 3

WORKING GROUP SUMMARIES

The workshop participants divided into two groups to discuss different aspects of a biodiversity information network. The separate groups made recommendations which, following further plenary discussions, were compiled into a single statement. The following are the compiled statements.

3.1 THE NEEDS AND SCOPE OF A BIODIVERSITY INFORMATION NETWORK

A biodiversity network is a mechanism for linking information relevant to biodiversity and making it widely available by electronic and other means.

Its purpose is to support the Convention on Biological Diversity and the Agenda 21 that followed the Earth Summit in Rio, June 1992. It will do this by facilitating efficient access to information relating to all aspects of biodiversity. It will underpin the study of biodiversity, as well as its monitoring, management, use, conservation and preservation. By establishing links to many data resources it will lead to the better use of information. It will promote the concept of biodiversity and encourage the development of databases and networks, so stimulating and supporting scientific development and conservation.

A network for biodiversity must be global and interdisciplinary. It must be accessible worldwide at the lowest possible cost. It must take into account the needs of geographical areas where there are technical and other limitations so that use is not barred to participants by such problems as economic instability or decline, currency difficulties or language differences.

The participants of the network will have a common interest in biodiversity. They will be members of the scientific community searching information both within their own areas of interest and also in other disciplines. For example, entomologists need to know about the plants visited by insects; those working on biological control need information on parasitoids and their hosts as well as the environmental factors affecting their distribution. Biodiversity is multidisciplinary and the information needed will cross the conventional biological borders.

The network will be equally valuable to policy makers, regulatory or legislative authorities with a need to develop appropriate directives based on authoritative information. Non-governmental organisations, international, intergovernmental and funding organisations will all have need of the network for a multiplicity of reasons ranging from science to policy and the assessment of priorities. The effects of climate on species distribution, the selection of sites for special study, and global warming studies all need access to diverse sets of data.

The needs of industry for access to information to support commercial developments and strategies will be facilitated by the network. The importance of training and education in biodiversity at all levels is a major reason for the setting up of such a network. The needs of schools should also be met, encouraging the interests of the next generation of biologists in the importance of biodiversity in all its aspects. Other participants in the network will include the media, public interest groups and many individuals with an interest in the topic.

The kinds of information accessed through the network will be as diverse as the users. Included will be data on molecular, organism, population, taxa, ecosystem and cultural levels of biodiversity. These will be distributed as metadata, directories, inventories and specialist databases and will cover scientific, monitoring, regulatory and legislative information, lists of experts, information on available standards, computing (hardware, software), biotechnology companies, consultants, scientific organisations, financial opportunities and other information that arises as the network develops.

This information will be distributed primarily electronically, but also on tapes, disks, CD-ROMs, books, newsletters, facsimile and all means that meet the needs of the biodiversity community. It is recognised that all regions of the world do not have ready access to online connections and other means of data distribution must be given priority in these regions. It is believed that electronic

distribution is the most efficient and economic means of data distribution and must be the goal for all. The means to achieve this must be met.

Associated with the information aspects of the network will be electronic mail facilities, since communication between scientists and other network participants is crucial to success and global participation. As well as the electronic network, the human network must be encouraged and facilitated. The biodiversity network will link to other appropriate networks already existing or to be developed.

Experience shows that the network must above all be flexible in design since the future needs cannot yet be known. The outcome of the workshop must be widely distributed for further comment. The workshop participants include a number of interested international organisations and a wide range of scientific interests are represented; further, several hundred individuals have participated online through the Bulletin Board and List Server and provided their views and experience. However, there will be others who will wish to contribute in the future and participate in the network. Their views must be solicited and taken into account. The workshop is only the first step in the establishment of a biodiversity network.

3.2 MODEL FOR A BIODIVERSITY NETWORK

A centralized system is unworkable and undesirable. The emphasis must be on delivery of information and facilitating contacts, and not on developing new hardware or data communications networks. The network must be flexible to accommodate existing and future needs and technologies.

A central coordinating group or secretariat is recommended to coordinate network and directory development, organize meetings, and coordinate training and support activities.

A distributed system is recommended, including regional/local nodes and cooperating groups with responsibilities for training, regional and disciplinary input, and distribution. Subject area specialists will direct users to specific contacts and information. The workload will be distributed among collaborating centres.

A key element will be a Directory of resources including information, contacts and organisations. The directory will be made widely available. It could be centralised, but a decentralised model will also be considered. Existing standards, such as CCITT X.500 directory model and the NASA Master Directory Interchange Format (DIF), will be investigated.

Distribution will include all media. Magnetic media and paper will continue to be important, especially for those with online access problems.

Each organisation will define their intellectual property rights, ownership of data, and access to it. Establishing a biodiversity network, and developing a critical mass of linked resources will hopefully provide an attractive market to which owners of data will wish to join. It is expected that there will be a natural evolution and growth of data providers and users.

Basic ways to access the network resources including electronic mail are needed for those who can't make on-line connections. Technical and financial barriers to accessing the network, including currency restrictions, need to be addressed.

Support for those undertaking field research is important. A directory of research projects with contact information could be established to identify potential resources and minimise duplication of effort. Funding agencies must be a part of the network.

Information about relevant existing standards will be included so that these are not re-developed unnecessarily.

It is desirable to continue operation of "biodiv-l" listserver, and seek to expand it to other networks. These existing dynamic systems allow collaborators to add information about their own resources and activities as a continuing process.

3.3 NETWORKING AND COMMUNICATIONS NEEDS

The aim is to facilitate communications and access to information by all available means (electronic, FAX, telephone, paper).

A directory of information resources - both human and scientific - should be distributed via paper, floppy disk, on-line.

It is anticipated that the barriers between various data communications systems/technologies will disappear within the next few years thus eliminating the present differences between research and public/commercial data networks.

When direct on-line links are not feasible/affordable, electronic mail and dbserver technology can provide the communications and access to the data and other resources. It is expected that data communications will become a utility like the telephone, and will be paid for in a similar way.

There was agreement on the importance of training, awareness, and promotion. It was also agreed that there was a need for a central secretariat to maintain the network, seek funding, and carry out other administrative functions. A list of criteria for hosting a secretariat and its functions should be drawn up.

There was agreement on the need for regional nodes and cooperators to provide information about what is available, who is active, and to provide support for local users/participants. The aim is to provide a network where the databases and human resources are widely distributed geographically. It is NOT the aim to integrate data. Centralizing data into a massive storage system is not realistic or desirable.

The future will probably see expert systems talking to each other and "teaching" themselves how to interact, so that queries can be responded transparently to the user, independently of the physical location of the information source.

There is a need for a technical working group to advance and detail a proposal for implementing and managing the network and directory system. It should consider new technologies and existing low-cost systems such as low-orbit satellite store and forward techniques. Existing networks should be identified in order to organize the promotion process. A newsgroup on USENET could be made available in 6 weeks.

3.4 ADMINISTRATION AND FUNDING NEEDS

This initiative will be identified as the "Biodiversity Information Network 21 (BIN21)" after the completion of the workshop. There will be NO formal membership required to participate in the BIN21.

An interim steering committee will be selected from the current workshop participants to assist in developing a proposal to be used to approach funding organizations. The Steering Committee will have a pro-active role in advocating the BIN21 efforts which will help to continue the momentum that has been started with this workshop.

The proposal will include elements needed to:

- set up the "biodiversity information network 21"
- set up a secretariat
- set up or identify regional coordinating centres
- fund the working groups for technical matters; training, funding, directory structure, editing/moderating
- illicit support for sponsorship of the network.

A secretariat with a staff of 2/3 persons will be set up. Its roles will be to:

1. act as a focal point and clearing house for the BIN21. This will be an initial access point for information about the network;
2. develop and write proposals for further network funding;
3. provide support for all working groups and regional representatives;
4. carry out administrative functions (for meetings, etc.);
5. distribute and manage the directory;
6. provide systems management;
7. provide training. This could take the form of dispensing groups to supply training on network related matters;
8. find sponsors. These may be scientific, development, funding, technical, government agencies and/or NGOs.

The host for the secretariat should preferably be a non-profit, NGO organization with international involvement with biodiversity. The host should also have existing infrastructure to support the computer communication activities of the BIN21.

The working groups listed below will be formed before the end of this workshop. At least one person should be identified to lead each of these groups. These working groups will help to carry forward discussions on the subjects relevant to BIN21. Other people should be invited to join in the discussions of the working groups at any time. The working groups will report to the Secretariat at regular, unspecified intervals. Mechanisms for on-line communication between and within working groups will be developed before the end of the workshop.

Working groups:

1. technical working group (hardware, software, communications);
2. editorial/moderating working group (to provide a moderating function for the information that comes in);
3. directory creation and management working group;
4. training working group;

5. funding working group.

Subject-oriented groups and/organizations are expected to join in the activities of the BIN21. Many of these groups may participate by acting as a principal focal point for specific types of data and information related to their fields of expertise. These groups may include: the Botanic Gardens Conservation Secretariat (BGSC), the MSDN, IOPI/TDWG, IUCN SSC and IUCN CNPPA.

Regional representatives will be identified to fulfil similar functions to that of the Secretariat, but on a regional basis. They will help to identify regional cooperating centres (nodes) that will be established with the purpose of encouraging participation and development. These will be integrated with existing centres to prevent duplication of effort.

Funding for running BIN21 is needed for the following:

1. the operation of a secretariat of 2/3 people including all expenses;
2. expenses resulting from the operation of the working groups for communication, travel, and other operating costs;
3. selection, buying or writing of directory software;
4. compilation and maintenance of a directory of resources including providing some funds to groups that already maintain data that is important to the network;
5. support for regional representatives; 1 person and facilities at each node;
6. a follow-up meeting/workshop;
7. consultancy/software costs;
8. setting up of a trust fund to help establish the regional groups.

3.5 ACTION ITEMS

[NOTE: These are not in any order of priority and are listed as the items arose in the discussions]

Shorter term

1. Establish interim steering committee
2. Further define network needs
3. Establish Usenet group/List/Bulletin Boards
4. Survey existing initiatives
5. Solicit opinions and participation of other groups
6. Start to establish Working Groups
7. Design the Directory and implement
8. Seek funding
9. Promotion and publicity
10. Identify regional groups
11. Develop workplan and schedule
12. Set up a network communications mechanism (mail system)
13. Establish a mechanism for selecting Secretariat
14. Systems analysis
15. Proceedings

Longer term

1. AI/Expert system to improve access
2. Infrastructure (communications) in developing countries
3. Support to regional groups
4. Long term research programme to identify gaps
5. Establish permanent Secretariat
6. Establish training programme
7. Assess progress.

3.6 WORKING GROUPS AND ASSOCIATED ACTIVITIES AS LISTED ABOVE

[NOTE: The following names are of people to START the working groups' activities; they will find interested people/experts/volunteers willing to help with the work and expand the Groups]

Interim Steering Committee 6, 8, 11, 13, 15, L3, L4, L5, L7 (B Kirsop, A Whitworth, J McComb, B Dias)

Technical 3, 7, 12, 14, L1 (A Whitworth, D Jinks)

Editorial/Moderating 7, 14 (D Lange, E Ross)

Training L6 (V Canhos)

Outreach 1, 4, 5, 6, 10, L2, L3 (J McComb, L Blaine)

Promotion and Publicity 9 (C Afonso, B Pitkin)

CHAPTER 4

PAPERS SUBMITTED BY WORKSHOP DELEGATES

The papers in this Section of the Proceedings were contributed by those present at the workshop in person, or on behalf of their colleagues or collaborators. The papers that were contributed online during or within the following two weeks of the Workshop are in the following Section.

4.1 THE TROPICAL DATABASE

Vanderlei Canhos
Sidnei de Souza
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The Tropical Data Base (Base de Dados Tropical - BDT), is an information center, created to be a link between culture collections and their users. It is a department within the Fundacao Tropical de Pesquisas e Tecnologia "Andre Tosello", a not-for-profit, private foundation.

As major activities, BDT is involved with the collection, analysis and dissemination of data from scientific collections and with the development of software for data management.

BDT's work with microbial strain data and information on Brazilian culture collections began in 1982. Throughout the years, 3 editions of the National Catalogue of Strains were published, a national survey on Brazilian culture collections was carried out, and a successful training programme was established. All information has been available on-line since 1985.

The importance of this experience is its uniqueness and its success. It is a case where collection, organization, storage, and dissemination of data, is directly responsible for the formulation of a national policy for culture collections and for the organization of a scientific community conscious of the importance and of the role of culture collections.

BDT has recently expanded its scope of activities, including data on Brazilian herbaria and a database on "Who's Who in Botany in Brazil". During the year of 1992/93, the BDT will be collecting information and setting up a database on "Who is Who in Biodiversity", with information on specialists working with Brazilian flora, fauna and microbiota. This project is being sponsored by the institute responsible for environmental policy in Brazil, IBAMA (Instituto Brasileiro de Meio Ambiente e dos Recursos Naturais Renovaveis).

Recognizing the need and importance of local and regional database developments, the BDT has established an interactive biodiversity/biotechnology information resource and user's network. The system is linked to major international networks and information centres, and is being managed by SUN workstations. BDT-Net is available on-line to users through an X.25 dedicated line and can also be accessed through a gateway from MSDN (Microbial Strain Data Network). BDT is a node of the Brazilian Research Network (RNP), and database searching can also be carried out through any international network such as Bitnet, Internet, Janet, by mailing a query to the database server. This query is carried out automatically by the system and the answer is sent by e-mail to the user.

A number of the MSDN-linked databases are now hosted on the BDT computer for international online access. The software used for searching both MSDN and BDT databases, known as 'INFO', was developed by the BDT staff, and is being used today by MSDN for some of its databases. 'INFO' was developed to attend to specific needs and to cope with hardware limitations, making this system adequate for other developing countries.

4.2 MICROBIAL STRAIN DATA NETWORK (MSDN)

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The MSDN is an international information and communications network for microbiologists and biotechnologists. It is sponsored by four sectors of the International Council of Scientific Unions. These are the International Union of Microbiological Societies (IUMS), the World Federation for Culture Collections (WFCC), the Committee on Data for Science and Technology (CODATA) and the Committee for Biotechnology (COBIOTECH). It is a not-for-profit Company Limited by Guarantee, with a Secretariat in Cambridge, UK.

The MSDN has a staff of three at the Secretariat and part time help for accounts management and regional support. Many of the functions of the network are distributed among different parts of the world. The result is an international effort, sharing the work load and the costs. Thus, many of the databases are hosted on the Tropical Database computer in Brazil, specialised software for microbial database management and a coding system (RKC Code) are maintained or developed by colleagues in the USA, regional networks have been established - or are planned - in many different countries (Russia, India, Australia, Latin America), specialist scientific support (eg for viruses, genetic strains) is provided by collaborating laboratories worldwide and scientists from many regions join the MSDN as faculty on training courses and workshops.

The MSDN is supported by grants from a number of agencies and also recovers about 30% of its core costs from a surcharge placed on usage. A commercial carrier is used (BT Gold and BT North America) to allow access by all users - whether academic, industrial or administrative. Connect charges are the BT rates plus the small MSDN surcharge; the data is in the main free. A link to the academic network, INTERNET, has recently been established. Some 400 mail boxes have been issued to scientists from 32 countries.

The network provides an integrated service incorporating the following:

Databases
Bulletin Boards
Computer Conferences
Electronic Mail\Fax\Telex
Directory of users
User manuals
Demonstration disks
Training courses\workshops
Individual training
Information brokering
Distribution of software

All of these services, including any of the databases, may be reached from a single access point and selected from a single menu.

It follows that the MSDN is a linking and facilitating mechanism, with the aim of supporting bi-directional information exchange and communication between microbiologists and biotechnologists throughout the world.

The databases hold information on microorganisms and cultured cells (bacteria, filamentous fungi, yeasts, algae, protozoa, viruses, plasmids, genetically marked strains, animal cells, hybridomas) as well as general biotechnology and culture collection information. The databases are directories, strain databases, catalogues, bibliographic and general biotechnology and culture collection databases (see below). Some (marked +) are maintained on the BDT computer and use a common search program (INFO, developed at BDT); others are maintained on remote computers and are linked to the MSDN via electronic gateways. Links have been established to the DataStar bibliographic databases, the INTERNET system, the IRRO network (on the release of organisms into the environment).

A number of electronic Bulletin Boards have been set up, including those for the MSDN itself, Information Resource for the Release of Organisms (IRRO), the European Biotechnology Information Service (EBIS) of the CEC's Biotechnology Directorate and the European Standards for Biotechnology Technical Committee (CEN). Computer Conferences have been provided from time to time, the most important of which was for the support of a two-centred workshop (necessitated by travel restrictions during the Gulf War) preceding the establishment of the IRRO. During this Conference parallel discussions were held in Maryland, USA and Vienna, Austria on the needs and specifications of such a network, and were linked electronically.

Existing activities of the MSDN impinge on the global biodiversity programmes now under discussion. Support for database development and global distribution, standardisation of microbiological data, electronic communications between collaborating scientists and the location of microbial resource centres and other laboratories with specific data records are all essential elements of the international activities planned under AGENDA21. After four years of development, integrated services for microbiologists and biotechnologists are in place and the number of linked databases is growing. The use of the MSDN system for the IRRO network adds another dimension to the overall service, and links to databases in such areas as biocontrol and releases are now under discussion. The MSDN believes that its experience in linking distributed databases and networks, combined with its specialist subject matter knowledge, can provide valuable material for discussion with similar groups in other disciplines. It welcomes the possibility of integrating its activities with those developing elsewhere and within other biosciences to form a comprehensive biodiversity information resource. It believes that this is an essential and fundamental activity that will underpin other scientific work. Without a mechanism for linking existing and new initiatives, much important information will remain unknown and under-used.

The MSDN anticipates working with other biologists in the establishment of an integrated resource. It recognises the necessity of pooling experience. Interdisciplinary cooperation will encourage the use of new networking skills, stimulate bioinformatics developments and avoid unnecessary duplication of effort. It is the experience of the MSDN that efforts to organise and disseminate scientific data have the added effect of encouraging research itself, particularly in regions that are geographically isolated or experiencing economic difficulties.

The establishment of working groups, and the development of an inventory of available resources are seen to be the necessary first steps in the development of a biodiversity network. The MSDN is enthusiastic to cooperate as its specialist skills allow in achieving these aims.

DATABASES ACCESSIBLE THROUGH THE MSDN NETWORK

'+' denotes databases using INFO software

* MICROBIAL STRAIN DATA NETWORK (MSDN) DIRECTORY+
A directory for locating laboratories and culture collections having information on microbial cultures with specific, scientifically defined properties. Produced and maintained by the MSDN secretariat, Cambridge, UK.

* AMERICAN TYPE CULTURE COLLECTION (ATCC) DATABASES+
Databases produced and maintained by the ATCC, Rockville MD, USA and include the ATCC Cell Lines Catalogue, ATCC Recombinant Materials Database, and ATCC Bacteria, Phages and Media Catalogue.

* EUROPEAN COLLECTION OF ANIMAL CELL CULTURES DATABASE (ECACC)+
Produced from Porton Down, Salisbury, UK.

* UK NATIONAL COLLECTIONS OF YEASTS & FOOD BACTERIA (NCYC/NCFB)
Produced by NCYC, Norwich, UK and maintained on the Institute Vax computer.

* UK CULTURE COLLECTIONS DATABASES (MICIS)
Maintained on the DSM/GBF computer in Braunschweig, Germany. The MiCIS database contains information about the test results (strain data) for cultures held in the UK service culture collections. Also available are the UK Culture Collection of Algae and Protozoa (CCAP) database and a database of contact information for European collections.

* DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN (DSM) DATABASES
Maintained on the DSM/GBF computer in Braunschweig, Germany. Catalogue and strain data for yeasts, bacteria and filamentous fungi are available, as well as the Approved List of Bacterial Names.

* NETHERLANDS CULTURE COLLECTION DATABASES (CBS/NCC)
Maintained on the computer of the Centraalbureau voor Schimmelcultures in the Netherlands. Catalogue and strain data for yeasts, bacteria and filamentous fungi are available.

* FRANCE (MINE) CULTURE COLLECTION DATABASES
Available through SUNIST in France which form a part of the MINE Network. Catalogue and strain data for bacterial and fungi are available, and can be searched either in French or in English.

* HYBRIDOMA DATA BANK DIRECTORY (HDB) THROUGH CAN/SND
The CODATA/IUIS HDB is maintained on the Canadian Scientific Numeric Database System (CAN/SND). Information on over 20,000 records describing individual hybridomas and/or their monoclonal antibody products is available.

* WORLD DATA CENTER (WDC) DATABASES
Maintained at RIKEN, Japan. A directory to culture collections worldwide and the species maintained, the HDB database (see above), and databases on algal collections worldwide, hybridomas and bibliographic information on plant tissue and cell cultures are available.

* TROPICAL DATABASES BRAZIL (BDT)+
Maintained at the Base de Dados Tropical (BDT) system, Campinas, Brazil. Includes the national Brazilian catalogue of strains, information about research activities and contacts for Brazilian

collections. Information concerning bacteria, yeasts, fungi, algae, cell lines and viruses is available. Searches can be carried out in either Portuguese or English.

* DATASTAR DATABASES
Access is provided to the bibliographic databases available through the commercial database host, Datastar, located in Berne, Switzerland. A wide range of scientific (including biomedical, chemical, and biotechnology) databases are available as well as business and reference databases.

* CYCLOPEAN GATEWAY SERVICE (CGS) DATABASES
Easy access is provided to the databases (over 850) distributed by 13 worldwide commercial bibliographic database hosts. Broad subject areas covered include science and technology, medicine and health care, business, patents, law, social sciences, education, arts, people, literature and religion. The CGS system is provided by BT North America.

* BIOINDUSTRY ASSOCIATION (BIA) DATABASES+
Produced by the UK Bioindustry Association. These databases cover the field of UK and EC regulatory issues concerning biotechnology and exports assistance for the UK. Information about forthcoming conferences, trade missions, etc. concerning biotechnology is available; the latest BIA online news bulletin; and contact information for National Biotechnology Associations.

* BIOTECHNOLOGY COURSES (BEMET) DATABASES+
Produced by BEMET 'Biotechnology in Europe: Manpower, Education and Training'. The database currently describes biotechnology courses from academic institutions in the UK, but is being extended to include Europe-wide courses.

* BIOTECH KNOWLEDGE SOURCES (BKS) DATABASE+
A listing of new publications and forthcoming conferences in the field of biotechnology. Produced by BioCommerce Data Ltd and updated monthly. Covers books and other media, including software, videos, databases etc. Conference coverage is worldwide, up to 12 months from the current date.

* CZECHOSLOVAK CATALOGUE OF FILAMENTOUS FUNGI (CCF)
Produced by the Culture Collection of Fungi, Charles University, Prague. Contains records of about 1600 strains of Zygomycetes and Ascomycetes in both teleomorphic and anamorphic states.

* CZECHOSLOVAK CATALOGUE OF ALGAE AND CYANOBACTERIA (CCALA)
Produced by the Culture Collection of Autotrophic Organisms at the Institute of Botany, Czechoslovak Academy of Sciences, Trebon. Incorporates the Uhlir and Pringsheim collection established at Charles University in 1913. Includes cyanophytes, algae, mosses, liverworts, ferns and duckweeds.

[UNDER DEVELOPMENT: Animal Virus Database, Czech Collection of Microorganisms catalogue, International Mycological Institute Catalogue. For IRRO network: BIOTRACK OECD database on releases, BIOCAT database on the interaction between insects and insects, UNIDO Guidelines for the release of organisms.]

MSDN BULLETIN BOARDS

MSDN BULLETIN BOARD - edited by MSDN. This has categories on general information relating to databases, culture collection news, microbial and monoclonal antibody exchange, user notices, jobs and MICROIS software information. Also the MSDN newsletter is available on this Bulletin Board.

EUROPEAN BIOTECHNOLOGY INFORMATION SERVICE (EBIS) - edited by the Concertation Unit for Biotechnology in Europe (CUBE, DGX11, SDM-2/66, 200 Rue de la Loi, 1014 Brussels, Belgium). This has categories on editorials, community activities, member states, international developments, feature articles, association news, reports and books, press reviews, meeting agendas.

EUROPEAN BIOTECHNOLOGY STANDARDS - edited by the CEN TECHNICAL COMMITTEE 233 WORKING GROUP 4. It has a closed category for committee members and an open category for discussions on standards in biotechnology and related areas. This Bulletin Board is new and additional categories will be added as the initiative develops.

INFORMATION RESOURCE FOR THE RELEASE OF ORGANISMS into the environment (IRRO) - edited by the IRRO Steering Committee:

FOR ACCESS TO THE BULLETIN BOARD OF THE INFORMATION RESOURCE ON THE RELEASE OF ORGANISMS INTO THE ENVIRONMENT (IRRO), TYPE 'IRRO' AT SYSTEMS PROMPT AND SELECT THE BULLETIN BOARD OPTION FROM THE MENU.

BIODIVERSITY WORKSHOP BULLETIN BOARD - set up to support the Campinas Workshop, and to be continued subsequently.

4.3 STATUS OF ENVIRONMENTAL REPORTING

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The demand for reliable up-to-date information on the conservation of species and ecosystems is growing as awareness of the consequences of environmental change becomes more widespread. It is the World Conservation Monitoring Centre's role both to provide such information and to promote its application for enlightened conservation planning.

WCMC is an independent charity established by the three leading agencies in the conservation movement: IUCN - The World Conservation Union, WWF - World Wide Fund for Nature, and UNEP - United Nations Environment Programme. Its mission is to support international programmes for conservation and sustainable development through the provision of information on the world's biological diversity.

WCMC: WHAT IT DOES

WCMC provides an information service on global conservation. It achieves this by:

- Gathering data on species, habitats and sites through an extensive network of worldwide contacts;
- Managing this central repository of information to facilitate its analysis and distribution;
- Disseminating this information as widely as possible in a form suitable for direct application by the conservation and development community; and
- Promoting the development of information networks to improve the exchange of data, including the establishment of data centres in developing countries.

WCMC manages substantial information holdings covering:

- plant and animal species of conservation concern;
- important natural habitats and sites of high biological diversity;
- the global network of national parks and protected areas;
- wildlife utilisation and the volume and impact of the international trade in wildlife; and
- conservation bibliography, including both published and unpublished literature.

WCMC provides an information service to a wide array of users ranging from governments, development agencies, non-governmental organisations and multinational corporations to individual scientists, journalists and conservationists.

Although a charge may be made for its services based on staff time involved and ability to pay, WCMC encourages the free two- way exchange of data with conservation agencies and research scientists.

To monitor the impact of man upon nature is a major task. It is only through collaborative working between agencies with the development of networks for information flow, particularly in developing countries, that the support for conservation can be mobilised.

WCMC has now embarked upon an ambitious five-year programme to promote these networks and to develop further its central database capabilities and information services. The Centre looks to the scientific and conservation community for guidance and support in carrying this programme forward.

WCMC: WHERE IT IS GOING

To monitor the diversity of life on earth is a colossal task. Although WCMC will continue to serve as a central information repository, the way forward lies in developing information networks linking the conservation agencies and field workers that actually gather data with other users of that data. WCMC will play a leading role in promoting the establishment of these networks, particularly through the development of national conservation data centres in developing countries, to prepare the standard formats for the exchange of electronic data, and to provide reciprocal benefits to data contributors through access to its global information holdings.

Because a key element of conservation data is "where", WCMC has made a major commitment to geographic information systems (GIS). This powerful tool is useful for analysis and presentation. A Biodiversity Map Library of digitized maps and associated data covering vegetation types, tropical forests, other habitats of conservation concern, and protected areas is being developed. WCMC already has substantial GIS holdings in these areas which are being continually expanded.

There is little point in improving the information handling capabilities of the Centre without effectively marketing its services. WCMC will continue to provide an "added value" information service to a broad range of users based on the analysis and interpretation of its data holdings.

Projects in progress include:

- threatened species, especially elephants, whales and other marine mammals;
- plant species threatened by trade, such as cacti and orchids;
- The Conservation Atlas of Tropical Forests;
- critical sites for the conservation of biological diversity;
- a digital map of Antarctic; and
- a directory of national parks and protected areas of the world.

A major compendium of conservation data entitled Global Biodiversity: Status of the Earth's Living Resources has just been completed. With funding from the UK Overseas Development Administration, The Netherlands Ministry of Foreign Affairs, and the Danish Ministry of the Environment. It is the most complete and authoritative reference work on global conservation, with the information presented on a country-by-country basis. An electronic edition of this publication is in preparation.

4.4 NODO ALTERNEX

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Fax: 55 21 2860541 Telex: 2136466 BASE BR
Dial-up access:(021)286-0024 and (021)266-3088
RENPAC NUA:(724)12150479
Internet: suporte@ibase.br

International data communication for peace, social justice, solidarity, human rights, democracy and ecological protection. A service of IBASE and the Association for Progressive Communications (APC).

WHAT IS AlterNex?

AlterNex is a non-profit, international data communication service operated by IBASE in cooperation with the Association for Progressive Communications (APC), designed especially for individuals and nongovernmental organizations.

Inaugurated in July of 1989, it offers electronic mail services, permanent conferences (public or private), access to databases and fax and telex service.

Supported by a powerful computer communication system, operating 24 hours a day, it services hundreds of organizations and individuals inside and outside Brazil, allowing for rapid and inexpensive exchange of information with hundreds of thousands of people and institutions in practically every country in the world. Directly or through other nodes in the APC network, the system provides contact with a large number of international data communication networks.

Currently, the AlterNex network includes among its users, many different non-governmental organizations, unions, professional associations and researchers involved in a range of issues related to the social and political realities both in Brazil and internationally.

The hundreds of existing conferences in the system include topics such as human rights, environment, alternative technologies, energy, AIDS, economics and labour issues. It is also possible to consult conferences organized by Interpress Service (IPS), sent by journalists throughout the world, providing over a hundred pages of news each day.

The AlterNex node was installed thanks to the support of the United Nations Development Programme and Cooperazione e Sviluppo (CESVI, Italy), along with the support of the governments of Canada and Holland and equipment donated by Sun Microsystems, Inc.

IBASE

The Brazilian Institute for Social and Economic Analysis is a non-governmental, non-partisan, non-confessional, and non-profit organization. Its main objective is to collaborate in building a democratic society through the socialization of information and knowledge.

Working together with social movements, popular and labour organizations, NGOs and churches, IBASE identifies the promotion of democracy, solidarity, social justice and the strengthening of citizenship as the focus of its work.

Established in 1981, IBASE seeks to utilize and disseminate, along with social movements and organized civil society, modern and efficient means to reach its goals. It has been, in this sense, a pioneer NGO in the utilization of information and telecommunications.

APC

The Association for Progressive Communications, formally established in 1990, joins together entities operating telecommunication systems with common objectives: peace, prevention of war, elimination of militarism, environmental protection, human rights, elimination of poverty, promotion of equitable development and social and economic justice.

Within its international partnership, APC includes among its members, in addition to AlterNex: IGC (USA, with econet, peacenet, conflictnet, and homeonet), WEB (Canada), GreenNet (England), NordNet (Sweden), Pegasus (Australia), Nicarao (Nicaragua), Chasque (Uruguay), ComLink (Germany), GlasNet (Russia) and EcuaNet (Ecuador).

Through the use of "gateways" with other networks (Internet, Bitnet, DasNet, FIDO) the reach of the APC network is extended to all continents.

WHO USES THE SYSTEM

The list bellow is a small example of the thousands of organizations using the AlterNex and APC networks:

ABIA (Brazil), Russian Science Academy, Agrodata (Uruguay), AJUP (Brazil), ALIDE (Peru), International Amnesty (England), Centro Luiz Freire (Brazil), CIMI (Brazil), CLACSO (Argentina), CLADES (Chile), CNN (USA), CPT (Brazil), CRIES (Nicarao), CSUCA (Costa Rica), CUT (Brazil), DESCO (Peru), FASE (Brazil), Federacion Internacional de Periodistas (FIP, Venezuela), FIOM-CGIL (Italy), EZE (Germany), Global Action Network (USA), GreenPeace, IDICT (Cuba), IDRC (Canada and Uruguay), ILET (Chile), ISER (Brazil), MLAL (Italy), NOVIB (Netherlands), OXFAM (England and USA), PLACIEX (Peru), PNUD, SAYCIT (Venezuela), Third Work Network, UNCED, UNICEF, World Wildlife Fund.

4.5 INFORMATION MANAGEMENT FOR BIODIVERSITY AN ANTARCTIC PERSPECTIVE

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SUMMARY

The aims of the Biodiversity Networking Workshop are to discuss the needs and specifications for a biodiversity computer network that will link existing information resources of importance to the biodiversity programmes now planned or underway. The goal of a biodiversity information network is extremely laudable, however its successful implementation will depend on solutions being found to a large number of problems and will be very difficult to achieve. Solving the technical networking issues will only be one problem amongst many. The network will only be as good as the data that it has access to. Ensuring the quality and validity of these data will be a major problem, as will persuading individual research scientists to make their data available.

This short paper reviews two large-scale Antarctic biological research programmes (BIOMASS and BIOTAS) and describes the lessons learned which might well be applicable to the aims of this workshop. The paper will also describe the steps currently underway to coordinate information management within the Antarctic scientific community and one of the problems that has been faced. A set of points is presented that should be taken into account when specifying the requirements for a biodiversity information network, based on the lessons learned from Antarctic data management.

ANTARCTICA, AN INTRODUCTION

Antarctica is probably the least known of the world's regions. Isolated from other land areas by vast tracts of inhospitable and stormy oceans it is the coldest continent with an average annual temperature at the South Pole of -49 C. It is a large continent with a total land area of 14 million square kilometres and, in addition, the winter sea-ice zone extends over another 7 million square kilometres. The Antarctic and surrounding seas South of the Antarctic Convergence, at approximately 50 degree S, comprises just under 30% of the Earth's surface, whilst the continent itself contains 90% of the world's ice and snow.

The value of the Antarctic terrestrial, inland water and littoral ecosystems, which provide a natural species-depauperate laboratory for testing fundamental ecological principles is now widely appreciated. Increasing attention is also being paid to the response of polar organisms and ecosystems to human impact and changing climate, on both the local and global scale. In contrast with the relatively few species on land, the marine ecosystem is both rich and diverse and has already faced exploitation.

There has always been a strong element of collaboration between members of the international Antarctic scientific community. The Scientific Committee on Antarctic Research (SCAR), established in 1958, is a Scientific Committee on the International Council of Scientific Unions, and is charged with the initiation, promotion and coordination of scientific activity in the Antarctic. Two SCAR sponsored programmes within the biological sciences are the Biological Investigations

of Terrestrial Antarctic Systems (BIOTAS) Programme and the Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS) Programme, which has just finished.

THE BIOMASS PROGRAMME

The BIOMASS Programme was established in the late 1970's for the study of the Antarctic marine ecosystem and its living resources. Data were collected during 3 major field experiments between 1981 and 1985. The first focused on extended spatial coverage, whilst the second and third were concerned with repeat sampling at pre-defined locations to give a temporal sequence. Data collected from these field experiments were transferred to a central BIOMASS Data Centre to enable their standardisation for integrated analysis. The Data Centre was also responsible for running a series of data analysis workshops. With the end of the BIOMASS Programme in 1991, the data set and its supporting documentation are being prepared for distribution to those scientists who took part in BIOMASS and to any other investigators who request copies. The BIOMASS Data Centre faced many problems in standardising, integrating and documenting the data supplied by individual researchers into a coherent data set. The majority of these problems were managerial rather than technical. There was a lack of integration of the data management with the objectives of the science programme. For example, the need for a BIOMASS Data Centre was identified in 1979, but it was not finally established until 1986. Once established, the Data Centre did not always respond to the scientific requirements of the programme. There was an over reliance on software that was developed within the Data Centre instead of using commercially available products. Time was spent creating and testing software, which would have been better spent supporting data analysis.

Problems were experienced in persuading individual researchers to contribute data to the Data Centre. Researchers often found that the effort involved in submitting their data to the Data Centre was much greater than the benefits they gained. Ensuring that the data were validated and of the required quality was also difficult. The task was hampered by the lack of supporting information about the data themselves (the meta-data). Restricted access to certain data sets reduced the effectiveness of the BIOMASS Data Centre and it operated for much of its life with a very restrictive data access protocol. This was designed to protect some data sets before their originators had published their own analyses, but hampered the distribution of data to the wider BIOMASS community.

The lessons that have been learned from BIOMASS about the management of complex, large-scale, biological data sets will be of great use to future programmes. Increasing the quality of data holdings, especially by the inclusion of meta-data, will increase the chances of successfully net-working databases together to support biodiversity and other research. More information about the BIOMASS Data Centre and the lessons learned about data management during its lifetime can be found in Thorley and Trathan (1992).

THE BIOTAS PROGRAMME

The BIOTAS Programme was established in the late 1980's to coordinate terrestrial, limnological and littoral biological and related environmental research in the Antarctic. BIOTAS is a body of interacting scientists with common interests and goals who exchange ideas and information to ensure awareness of current and proposed research. This is to help maximise the value of their own research and to minimise the duplication of effort and the wasting of resources.

The objectives of BIOTAS include the encouragement of collaboration and, where desirable, replication of research studies using standardised procedures. Also, to encourage research studies to follow a more unified approach, so that national programmes may complement each other and permit a more valid comparison of data between localities and systems. To facilitate this, BIOTAS

has produced a manual of methods to aid standardisation and inter-comparability (Wynn-Williams, 1992). As yet, there is no computer network linking members of BIOTAS. However, the Microbial Strain Data Network is already used by the British Antarctic Survey to hold data on microbial cultures and its use may well be extended to include other data sets of relevance to BIOTAS.

COORDINATING ANTARCTIC INFORMATION MANAGEMENT

SCAR, through its Committee for the Coordination of Antarctic Data (CCAD), is developing a strategy for the coordinated management of Antarctic information. As a first stage, the CCAD has started to compile a directory of available Antarctic data sets. A questionnaire was sent to all 23 SCAR National Committees, but replies were received from only 8 countries, and some of these were incomplete. To complete the survey in detail will require the drawing up of a list of individual investigators and then contacting them directly, to find out what data they are holding. This will be a long and difficult process.

POINTS THAT MUST BE CONSIDERED

The following points, based on the lessons learned from Antarctic data management, should be taken into account when specifying the requirements for a biodiversity information network.

1. Any biodiversity information network should meet real scientific requirements.

2. Wherever possible the technical solutions adopted should be based on industry standard hardware and software.

3. Individual researchers must be convinced of the benefits of belonging to such a network and of the returns they would get for making their own data available.

4. Mechanisms must be defined for ensuring that data available through the network are validated and of the required quality.

5. There must be open access to all data on the network, but due acknowledgement must be given to the researcher who has provided the data.

6. In future, consideration should be given to the adoption of standard methods for collecting and recording data, to enable a more direct comparison between different data sets, as is being done in BIOTAS. This will also ensure that the required meta-data is recorded.

7. Realistic estimates should be made of the resources required to develop a biodiversity network and sources of funding must be identified. For example, the amount of work required to develop a directory of relevant biodiversity data sets should not be underestimated.

8. The criteria for sites to be included in a biodiversity information network will need to be defined. Should the low diversity, but ecologically important Antarctic terrestrial ecosystems be included?

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4.6 BIOSIS

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BIOSIS is an independent, not-for-profit publisher of printed and computer-readable products in the Life Sciences with an ongoing commitment to foster the growth, communication and use of biological knowledge. Established in 1926, it is based in Philadelphia, USA and governed by a Board of Trustees drawn from both industrial and academic sectors of the community. Probably best known as the publisher of Biological Abstracts, since 1980 it has also had a wholly-owned subsidiary in York, England responsible for the compilation of Zoological Record.

These two major bibliographic databases - Biological Abstracts and Zoological Record - now cover some 675,000 references each year, drawn from over 12,000 serials together with books, conference proceedings and other original publications from virtually all the countries in the world. These databases are available in print form, as online files through commercial vendors, and on CD-ROM. There is a third smaller database, BioBusiness, covering the economic implications and business applications of biological and biomedical research, which is only available online. There are also a number of smaller specialist publications drawn from the main bibliographic database.

BIOSIS has two online systems of its own, the Life Science Network (LSN) which provides a specialised gateway to the commercial systems, and the TRF which is a microbiology electronic bulletin board and database.

The LSN is designed for individual researchers, not professional searchers, and offers access to 80 mainstream life science databases including Chemical Abstracts, MedLine, ToxLine, and many others. It also includes the BIOSIS Connection - a collection of smaller databases supported by BIOSIS and affiliated organisations such as the American Type Culture Collection Catalogues, together with all the BIOSIS databases. The LSN uses specially written software to simplify searching. It has no minimum charges, can scan single or multiple databases, and has extensive help facilities (including an online human operator). It is available through BT Tymnet, Sprintnet and the CompuServe network, and will shortly be available through the Internet.

The TRF includes the BIOSIS Register of Bacterial Nomenclature which contains a comprehensive list of some 13,000 bacterial names and their synonyms. It is only available by direct dial to the host system in Philadelphia. The same computer system has also been used on an experimental basis to offer access to other databases in York, including the Vicieae database which was one of the precursors of the International Legume Database & Information Service (ILDIS).

Other BIOSIS activities include close cooperation with the International Commission on Zoological Nomenclature in the development of a List of Generic Names in Use in Zoology, and links with similar activities which are taking place in botany. BIOSIS also plays a role in many biological societies and organisations, including those concerned with the development of standards.

BIOSIS is interested in attending the Workshop on a Biodiversity Network because it believes that the aims set out in the discussion papers, that resources in the life sciences are limited and that the way forward must be by cooperation - in the form of links between systems - rather than competition, are sensible and worth pursuing.

4.7 CAB INTERNATIONAL

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CAB International is an intergovernmental organization, owned by 31 governments, which provides information, scientific, and developmental services throughout the world.These services are vital to agriculture an allied fields in both developed and developing countries, providing ready access to scientific information and research back-up and assistance in identification and control. They provide support for sustainable agriculture and environmental management, especially in desirable pest management procedures and the understanding and maintenance of biodiversity. The organisation maintains a computerised database containing over 2 million abstracts; another 3 million are available in printed form. In 1991 it provided 30,000 volumes of abstract journals to 10,000 subscribing institutions in 160 countries and identified over 30,000 specimens of organisms (insects, fungi, bacteria, nematodes, helminths) for scientists in 86 countries. In that year training was given to 370 scientists from 80 countries. CAB International employs over 350 scientists and 150 support staff and the gross income for 1991 was in excess of 11 million.

In 1990 the CAB ABSTRACTS database was made available on CD-ROM and this successfully established a new generation of electronic publishing. By the end of 1990 these disks were in use in 40 countries where, in the case of developing countries, researchers are usually without access to reliable telecommunications and adequate library facilities. Other more specialised CB-ROM's are available including TREECD (with 300,000 abstracts covering 50 years of forestry), VVETCD (veterinary science) and CABPESTCD (20 years of information on crop protection and pest management).

Implementation of information technology in the scientific services started in 1989 and was largely complete by the end of 1990 with a microcomputer being available to each scientist. The identification services at the International Mycological Institute (IMI) and the International Institute of Entomology (IIE) are now automated by the use of data management systems which have been developed in-house. Integration of the identification service at IMI with other computerized databases an publishing activities has started and will continue through this year and 1993. IMI is collaborating with the USDDA/ARS National Fungus Collection (Beltsville) on a number of projects. CABI has interests in biodiversity and taxonomy of microorganisms (IMI is the coordinating centre for the IUBS/IAPT Names in Current Use initiative) and invertebrates; plant genetic resources; taxonomic databases including microorganisms (IMI maintains the Index of Fungi database), arthropods (IIE maintains the Arthropod Name Index) and viruses; databases of cultures (IMI is the UK node for the MINE project) and specimens; bibliographic databases generally; and electronic compendia. We are involved in BIONET, a concept for a permanent mechanism for mobilising, pooling and strengthening the world's wealth of biosystematic resources (both material and manpower), and a mechanism for facilitating the effective deployment of these resources in support of sustainable development, through a consortium of the world's major biosystematic centres supporting a series of regional loops; the first loop is to be established in the Caribbean. We are presently looking at ways to utilize available and developing electronic networking and telecommunications technology in the areas of interest outlined above. However, we consider that in the area of systematics, distributed/replicated databases are presently more cost effective than online services.

4.8 WHAT IS THE CGNET?

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CGNET Services International, Inc., was founded in 1983 to improve the effectiveness of researchers in developing countries. The primary vehicle for this effort has been the "CGNET," a communication network which interconnects a group of international research organizations via electronic mail and data transfer. The network is now entering its tenth year of continuous service.

The CGNET relies primarily on network facilities and services provided by various international telecommunication companies and academic networks. For example, from its headquarters in California, the CGNET is connected to the Internet backbone via the Bay Area Regional Research Network (BARRNET). Elsewhere in the United States and the United Kingdom, CGNET utilizes the computer-based messaging systems provided by BT Tymnet. In Hong Kong, Australia, Kenya, and elsewhere, arrangements have been made with local data communications companies to allow use of their services by members of the CGNET.

CGNET Services International conducts a range of activities relating to information technology. In addition to administering the electronic mail network, CGNET Services also: (1) consults in the areas of international voice and data communication, local area networking, and hardware and software specification; (2) develops software applications, especially for data retrieval systems for large databases on CD-ROM; and (3) sells personal and multi-user computer systems, software, and peripherals, primarily to international clients.

WHO USES THE CGNET?

At present the CGNET interconnects over 300 research locations in 60 countries. Most of the world's International Agricultural Research Centres (IARCS) are CGNET members, as are research organizations in several other fields. Member institutes of the CGNET include:

- Asian Vegetable Research and Development Canter (AVRDC, Taiwan)
- Centro Internacional de Agricultura Tropical (CIAT, Colombia)
- Centro International de Mejoramiento de Maiz y Trigo (CIMMYT, Mexico)
- Centro Internacional de la Papa (CIP, Peru)
- Centre for International Health (CIH, Canada)
- International Board for Plant Genetic Resources (IBPGR, Italy)
- International Centre of Insect Physiology and Ecology (ICIPE, Kenya)
- International Canter for Living Aquatic Resource Management (ICLARM, Philippines)
- International Canter for Research in Agroforestry (ICRAF, Kenya)
- International Crops Research Institute for the Semi-Arid Tropics (ICRISAT, India)
- International Development Research Centre (IDRC, Canada)
- Institute for International Education (IIE, USA)
- International Fertilizer Development Canter (IFDC, USA)
- International Food Policy Research Institute (IFPRI, USA)
- International Irrigation Management Institute (IIMI, Sri Lanka)
- International Institute of Tropical Agriculture (IITA, Nigeria)
- International Livestock Canter for Africa (ILCA, Ethiopia)

- International Laboratory for Research on Animal Diseases (ILRAD, Kenya)
- International Network for the Improvement of Banana and Plantain (INIBAP, France)
- International Rice Research Institute (IRRI, Philippines)
- International Service for National Agricultural Research (ISNAR, Netherlands)
- West Africa Rice Development Association (WARDA, Cote d'Ivoire)

Many other official development organizations are CGNET clients as well, including the World Bank, the US Agency for International Development, the Food and Agriculture Organization of the United Nations, CAB International, and the Australian International Development Assistance Bureau (AIDAB). Non-governmental institutions using the CGNET include Cornell and Purdue Universities, the Ford, Rockefeller, and Winrock Foundations, and Foster Parents PLAN International.

A full list of CGNET members can be retrieved by anonymous FTP from CGNET.COM.

ELECTRONIC MAIL SERVICES

CGNET currently offers two different types of telecommunications service: single mailboxes for clients with relatively small volumes of communication (CGNET I), and desk-to-desk electronic mail service for clients with local area networks and a high volume of communication (CGNET II). Both types of service include electronic mail, fax, and telex capabilities, and both provide our clients with a mail gateway to the INTERNET. Other services available on the CGNET include news clipping services, airline reservation information, and database services.

CGNET I

Each CGNET I member has an electronic mailbox (which is in fact a file on a large computer). As with a mailbox at an ordinary post office, people can send messages to the mailbox of a CGNET user, and the messages will remain there until the recipient picks them up. Unlike a physical mailbox, however, the recipient does not need to travel to the mailbox to pick it up. Instead, the recipient uses a computer and a modem to telephone the mailbox computer and then transmit the mail over the telephone connection.

The mailbox computers used for CGNET I are located in the U.S. and the U.K. To connect with them, most CGNET clients use their national or regional packet data (X.25) communications networks. In more than 100 countries around the world, it is now possible to make a local phone call to connect to any of thousands of large computer systems, including the CGNET mailbox computers.

CGNET II: DESK-TO-DESK E-MAIL FOR CLIENTS WITH LANS

For organizations with local area networks (LANs) and internal electronic mail systems, CGNET offers automated desk-to desk E-mail. Subscribers can use their LAN's internal E-mail system to exchange messages directly with other CGNET users (including CGNET II users, CGNET I users, and members of the Internet). In a sense, the addressing capabilities of the CGNET are integrated into the organization's internal E-mail system. This is accomplished via a system-to-system link, in which mail is routed automatically to each person's internal mailbox by software on the LAN.

This sort of desk-to-desk connection is analogous to the function of a PBX-based telephone system. Every user's mailbox is individually addressable by the outside world, and the messages are switched automatically by software in the same way that a PBX can route incoming telephone calls without an operator.

The desk-to-desk telecommunications service includes enhanced electronic mail capabilities and a number of special features such as the ability to search databases on many different computers or to exchange files with computers on the academic networks. These are in addition to the features of the basic service such as transmission of faxes, telexes, and cablegrams, and gateways to academic networks such as INTERNET, EARN, and BITNET.

TECHNOLOGY SUPPORT SERVICES

In response to requests from its network users, CGNET broadened its range of services in 1987 to include the supply of specialized information equipment. CGNET Services provides stand-alone and multiuser computer systems, local area networking (LAN) devices, computer peripherals, and communications devices ranging from modems to geo-positioning locators and small satellite earth stations.

CGNET provides complete on-site installation and training for complex systems such as local area networks. Among CGNET's larger projects over the past year have been Novell LANs in Addis Ababa, Ethiopia (400 nodes) and Rome, Italy (100 nodes). Equipment for research LANs has been provided to many locations, including Kenya, Niger, Syria, and the Netherlands. Technical support is furnished by E-mail, fax, and phone for the life of these products.

DATABASE DEVELOPMENT AND MARKETING SERVICES

CGNET Services also contracts to develop database systems for its clients, especially for germplasm collections, bibliographies, and CD-ROM applications. CGNET has produced a CD-ROM containing the characteristics of the 10,000 varieties of maize maintained by the Centro International de Mejoramiento de Maiz y Trigo (CIMMYT), as well as systems for combining and publishing maize data from several centres. In addition, CGNET has developed a wheat genebank management system for CIMMYT, and a general purpose multiple-crop system for small genebanks for the International Board for Plant Genetic Resources (IBPGR).

CGNET also helps bring databases to users. A marketing study analyzing the characteristics of prospective users of a scientific CD-ROM was conducted by CGNET in 1990, and since that time, CGNET has continued to evaluate database products. CGNET Services is also a distributor or a large number of commercially-produced CD-ROM databases, concentrating on increasing their availability among developing county researchers.

4.9 CODATA COMMISSION ON STANDARDIZED TERMINOLOGY FOR ACCESS TO BIOLOGICAL DATA

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The Committee on Data for Science and Technology (CODATA) of the International Council of Scientific Unions (ICSU) has created a Commission on Standardized Terminology for Access to Biological Data. During its biannual meeting in Karlsruhe, FRG in September 1988, CODATA hosted an International Workshop on the Vocabulary and Nomenclature of Biology. It was the consensus of participants that there are several outstanding examples of widely publicized and accepted sets of standard terms for describing biological entities, but that these well known "authorities" are the exception rather than the rule. It is clear that much work is being done by special groups and committees within the Bio- Unions. However, knowledge of the results are often confined to the originating sub- discipline. There are also areas of biology where standards of nomenclature do not exist. Members of the CODATA General Assembly approved a proposal to establish a Commission to address these problems.

The major purpose of the CODATA Commission is to focus the attention of the biological sciences and bioinformatics communities on the work of the Bio-Unions' standards setting bodies. It is NOT the intent of the Commission to set standards for biological nomenclature, but to facilitate communication among the subcommittees of the Bio-Unions and to ensure that the scientific community is aware and able to take advantage of their efforts.

The stated goal of the Commission is "to improve international access to and use of information resources in biology and related disciplines by promoting international and interdisciplinary cooperation in the development, enhancement, and use (in various languages) of terminologies, controlled vocabularies, nomenclatures, and classifications".

The subject of biological terminology would seem to be a critical element in the planning stages of biodiversity networking. Access to a comprehensive set of defined biological terms including synonyms, historical notes, and taxonomic position of named organisms is essential for access to integrated biological information. The plans for the Commission, outlined below, seem to parallel the workscope for addressing terminological aspects of biodiversity networks.

Rationale for CODATA's sponsorship of the Commission:

Among the primary objectives of CODATA is its goal to improve the quality, reliability, management and accessibility of data, especially that which is of interdisciplinary and international scope. The Commission's stated goal requires this type of coordination consistent with CODATA policy.

The Commission will make effective use of existing CODATA and ICSU components and activities, primarily through the Bio-Unions, their committees on nomenclature and taxonomy, task groups, and international membership.

Activities of the Commission:

Membership and Support

Letters and background reports describing the Commission and explaining its goals and plans were sent to all affiliates of the International Council of Scientific Unions (ICSU) concerned with the biological sciences. A request for comments and endorsement of the stated goals of the commission was overwhelmingly positive. Membership now consists of 11 Bio-union representatives and 11 ICSU associated organizations. There appears to be widespread recognition that the increasing number of biological databases and the requirement for linking subdisciplinary databases necessitates setting and publicizing standards for the nomenclature and terminology of biology.

Endorsement of the work of the Commission and expressions of willingness to participate in its work have been received from the following organizations.

Bio-Unions:

International Union of Biochemistry
Joint Committee on Biochemical Nomenclature
International Union of Pure and Applied Chemistry
International Union of Psychological Science
International Union of Biological Sciences
International Commission of Nomenclature for Cultivated Plants
International Society for Horticultural Sciences
Commission for Nomenclature and Registration
Taxonomic Databases in Plant Sciences Working Group
International Association for Plant Taxonomy
International Mycological Association: Section for General Mycology
International Union of Immunological Societies
International Union of Food Science & Technology
International Union of Microbiological Societies
Judicial Commission of the International Committee on Systematic Bacteriology
International Committee on Taxonomy of Viruses
International Commission of the Taxonomy of Fungi
International Union of Pharmacology
International Union of Toxicology (nonparticipatory endorsement)
International Union against Cancer
International Union of Nutritional Sciences

Other ICSU Affiliates and Database Producers Endorsing the Work of the Commission:

International Council for Scientific and Technical Information
World Federation for Culture Collections
Israel National CODATA Committee
International Geosphere-Biosphere Programme
International Organization for Standardization
International Information Centre for Terminology
Chinese National CODATA Committee
Chemical Abstracts Service
The Matrix of Biological Knowledge Group
Martinsrieder Institute for Protein Sequencing
Microbial Strain Data Network

BIOSIS
U.S. National Technical Information Service
European Molecular Biology Laboratory
Protein Information Resource
International Federation of Scientific Editors Associations

The Commission of the European Communities-DG XII, the U.S. National Science Foundation, and the National Canter for Biotechnology Information of the U.S. National Library of Medicine have provided funding for the initial work of the Commission including two international workshops and a model project described below.

Ongoing Activities:

Lists of existing sets of standards for biological terminology are being solicited from the relevant committees and commissions of the Bio-Unions. Organizations are being asked to indicate which sets of terms are available in electronic form. Each nomenclature committee and a description of its work is included in the Nomenclature subfile of the U.S. National Library of Medicine's Directory of Biotechnology Information Resources (DBIR). The Commission will attempt to provide wide access to this resource and to develop software that will facilitate direct data entry by the Bio-unions' representatives.

To date, the most comprehensive list has been received by the International Union of Biochemistry.

Concurrently with the effort to locate sets of existing standards, a model nomenclature problem has been selected to serve as a prototype for future work of the Commission. This prototype involves facilitating the setting of standard descriptors for virus characteristics. The virology model was chosen because several schemes for coding plant and animal characteristics have been developed. Thus the problem at hand is to merge the work of the international virology community and adopt a set of standards from existing terms, rather than beginning a totally new project.

A Workshop was held on March 19-20, 1990 which brought together members of the International Union of Microbiological Societies' International Committee on the Taxonomy of Viruses (ICTV), members of other international virology societies (International Society of Virology, International Phytopathology Association) and bioinformatics professionals. Participants examined existing terminology for the description and classification of plant and animal viruses and drafted recommendations for the ICTV.

The Code and Data Subcommittee of the ICTV has attempted to address the issue of standard terminology in the past. However, due to some disparity among plant and animal virologists, lack of publicity, and the changing technology that mandates periodic updating of existing coding schemes, the current listing of standards has not been universally accepted. This has resulted in duplication of effort by groups outside of the ICTV. Plant and animal virologists have tended to work independently of one another, especially in the area of developing a common vocabulary across disciplines. Prior efforts to classify characteristics of plant, insect, and vertebrate viruses show striking similarity in content, although the precise terminology is far from "standard." It is anticipated that the end product of this Workshop will be the publication of an accepted list of virus descriptors. The document should become the recognized standard for viral data storage and retrieval systems and would permit data exchange among laboratories throughout the world. This database will be produced under the auspices of the ICTV and will be facilitated by the CODATA Commission. A second Workshop was held in Nancy, France on 14-16 May 1991 to formulate a plan for improving access to standardized terminology for biological database producers and users. This Workshop was attended by representatives of the Bio-Unions, producers of bibliographic and

factual databases, and professional terminologists. This combination of participants, coming from disparate subdisciplines of biological and information science, provided an excellent blend of appropriate talents to address the multi-faceted problems of terminological standardization.

The dialogue engendered during the Workshop raised the awareness of the participants that the present interdisciplinary nature of many scientific activities leads to a greater need for exchange of information within the component parts. The impact of multinational projects, such as the "human genome" effort, similarly imposes added demands for clarity and standardization of expression. The integration of international, interdisciplinary databases will require some precision in defining terminology for uniform interpretation of scientific principles.

Future activities of the Commission will be led by a Steering Committee composed of a subset of the membership. The ultimate goal is to catalyze development of an international "term bank." This, of course, would have to be developed in modules and would necessitate preliminary studies to determine feasibility and user requirements. The Commission would also seek the cooperation of other international organizations. The enormous effort required to make such a term bank available to the international scientific community is recognized. While the computer and communication technology is available to link subsets of such a database, issues such as copyright, cost recovery, coordination, updating responsibilities, and funding are recognized to be potential barriers which must be overcome if the Commission is to attain its goal.

4.10 ENVIRONMENTAL RESOURCES INFORMATION NETWORK (ERIN) - An Overview

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Why have an Environmental Resources Information Network?

It has been estimated that more than 60% of Australia's plant and animal species have yet to be described and that tens of thousands of species of invertebrates and fungi await discovery. Late in the 1980s the Commonwealth Government sought to determine the severity and extent of Australian land degradation in order to establish priorities for funding soil conservation. This information could not be obtained from the existing soil and land survey coverage. With our environment being so poorly perceived, it hardly seems credible to attempt to determine the ecological impact of human activities in Australia, let alone claim to be managing ecologically sustainable development.

Yet, Australian governments are concerned to make ecologically responsible decisions about our use of the environment. To do this they must optimize their use of whatever information can be made available. The inability of Australian Government agencies to do this was apparent to the Cabinet and to the news media during the course of various environmental controversies in the 1980s. Decisions on environmental issues were being made in the heat of the moment in response to political pressures, in the absence of strategic plans, in ignorance of relevant research and without consideration of national and global perspectives. Accordingly, in July 1989, the Prime Minister made a Statement on the Environment, Our Country Our Future, in which he announced, among other things, the establishment of the Environmental Resources Information Network (ERIN) to:

> "draw together, upgrade and supplement information on the distribution of endangered species, vegetation types and heritage sites ... taking advantage of computerised geographic information system technologies that enable many different data types to be assessed and integrated ...[in] close cooperation with the States and Territories who have significant holdings of material."

ERIN's Mission

ERIN has a Mission to provide geographically-related information of an extent, quality and availability required for planning and decision making.

ERIN is to provide an information system for the Arts, Sport, the Environment and Territories [ASET] Portfolio by June 1992. An outline of ERIN's broad objectives is:

* to provide a network of environmental spatial information systems for use by environmental planners, managers, educators and decision makers;
* to ensure availability of relevant data sets and draw together, upgrade and supplement information about the natural environment;
* to co-ordinate national efforts to collect relevant information on the environment in cooperation with Commonwealth, State, Territory and other agencies;

* to provide a framework for assessing the implications for policy and management of environmental change or of particular actions involving environmental resource use;
* to enhance public awareness of Australia's natural environment.

The ERIN Program is based on the following principles:

A. Environmental information should be available through a network so that access is possible at the point where the information is required, rather than through a bureau-type service. This will result in a more rapid and effective transfer of knowledge about data and information to decision-makers.

B. The data should be stored on a network of computers, rather than on a central system, so that creators of a particular dataset could update and maintain it. Data should be immediately available on the network following updates.

C. A wide variety of data types should be accessible through an easy-to-use interface incorporating a comprehensive directory facility. This would simplify the decision making and planning process.

D. Modelling and analytical tools should be available through the same interface as that giving access to data.

E. Every effort must be made to acquire and store primary, rather than aggregated, data so that conclusions based on those data can be properly understood and rigorously reviewed, and so that baselines for monitoring are established. Original site data are the key to liberation from scale-dependent notions which have limited the utility of paper maps in modelling and analysis. This principle should be reflected in agreements with, and grants to, external agencies for the collection of data.

F. Planning, research, development and management in relation to environmental information must be based on established and well organized interdisciplinary and multi-agency collaboration and cooperation.

G. There should be easy access to data at minimum charges and without unnecessary administrative and other arbitrary encumbrances which would impede responsible environmental decision making.

ERIN's approach has been endorsed by the Australian and New Zealand Environment and Conservation Council (ANZECC).

Scope of the Difficulties Implicit in ERIN's Mission

The major problem facing ERIN is the sheer size of Australia. The area of the continent is approximately 7.7 million square kilometers. Added to this are the external territories (including the Australian Antarctic Territory), the continental shelf and the Australian Fishing Zone extending to 200 nautical miles from the edge of the 12-mile Territorial Sea.

Data coverage is inadequate for most of the nation and very little of the existing data is stored electronically. The quality of existing data is, largely, un suitable for meaningful analysis of environmental problems and there are problematic inconsistencies across the States.

Because of the size of the nation and the sparse distribution of roads and settlements, surveying even a small region for biological and physical data can take years and cost millions of dollars. The costs of surveys can increase exponentially with spatial resolution and increase again with temporal resolution.

The ERIN Unit - What Can it Hope to Achieve?

The ERIN Unit is a small group of scientists and computer analysts responsible for the management of the ERIN Program. It could not hope to make a significant impact, in the foreseeable future, on the major gaps in existing Australian environmental data. There are other Commonwealth Government organizations with responsibilities for capturing and storing many types of environmental data and information and for conducting and coordinating environmental research. However ERIN is filling a vacuum by facilitating and setting national priorities for the collection, standardization, storage in electronic form, and exchange of environmental data by Commonwealth, State and non-government groups.

The ERIN Unit is also providing necessary infrastructure for efficient and effective environmental decision-making by:

* developing and installing innovative databases and decision-support facilities;
* developing and installing tools for data analysis, standardization and quality control; and
* providing electronic networking facilities.

In addition, the Unit is developing computer-based tools for predicting the potential distributions of species from data that are available. Such predictions will be useful in (for example) evaluating the optimum allocation of land and other environmental resources for ecologically sustainable development and in projecting the likely impact of climate change scenarios.

Achievements to Date

Database Design

ERIN has co-ordinated the development of databases which link data on many themes and which provide management facilities, including:

* species distributions and taxonomic information including conservation status;
* managed areas (including nature conservation reserves, aboriginal and public lands);
* data management facilities based on the proposed national standards for spatial data exchange, with descriptions of data lineage, quality and format;
* management information - for corporate, program and financial management.

Datasets

ERIN holds copies of various infrastructure datasets, for example, roads, rivers, streams, electoral districts, public and aboriginal lands, topography, etc. as part of the background to its GIS activities. More importantly, however, ERIN has concentrated on gathering important biological datasets from around the country. These include significant Landcover plant taxa (currently numbering over 800,000 records), Rare or Threatened Plant data (40,000 records), environmental survey data (several thousand sites), data on birds, snakes, koalas and indicator species of insects. Various taxonomic datasets are also held on the Network, including the Australian Plant Name Index (60,000 records - in conjunction with the Australian National Botanic Gardens) and the Zoological Catalogue of Australia and Census of Australian vertebrate Species (in conjunction with

the Australian Biological Resources Study). NOAA-AVHRR data is also received on a fortnightly basis (integrated to make the image as cloud-free as possible) and this is being used to develop various phenological profiles of Australia's main vegetation types as well as to monitor fire, flood, drought, etc. Other data, such as Environmental Legislation, the Flora of Australia and Government Environment Reports, etc. are being made available across the network via text-retrieval software.

Data Standards

ERIN's database infrastructure provides a base for cooperation between the numerous institutions collecting environmental data. Most of these organizations have previously worked in isolation, so their databases are not necessarily compatible. Valuable data have often been stored in inappropriate and obsolete forms. The Unit is providing advice and mediating in negotiations on the appropriate storage of data to ensure longer-term relevance and utility.

ERIN Unit staff have also been very active in national and international discussions about standardizing and explicitly describing terms and methods of data collection, compilation and analysis. They have participated in national workshops on standards relating to wetlands, non-vascular plants, old-growth forests, taxonomic databasing and indicators of sustainable agriculture. The Unit has also hosted workshops on:

* Wildlife habitat (September 1990);
* Standardization of databasing activities of Australian herbaria records of landcover plants (February 1991) and interchange standards (May 1992);
* Core attribute standards for vegetation (May 1991); and
* Environmental Regionalisations (May 1992).

ERIN was also involved in co-hosting, along with the Australian Biological Resources Study and the Australian National Botanic Gardens, the TDWG and IOPI work shops in September, 1991.

Electronic Communications Network

The ERIN Unit has set up, and is now expanding, computing facilities needed to handle high volumes of spatially-referenced data. ISDN links (64kbps) are now operational between the ERIN Unit, and 3 remote sites within the metropolitan area. This facility allows for electronic mail, file transfer and database access. Access to the spatial database is provided through an X-Windows interface, using the ARCView product. It is envisaged that the ISDN lines will be upgraded to at least 128 kbps, to cater for the requirements of this interface.

The network consists of Sun workstations attached to a SparcServer 690, with Cisco routers at each node. The central site is networked using twisted pair Ethernet. A Novell network is attached to the central network, using X-terminal emulation, and an SMTP mail gateway. A Macintosh network is also connected.

ERIN is connected to the Internet through the Australian Academic and Research Network (AARNet). Current access is mail only, but this is in the process of being upgraded to full login status, across 64kbps ISDN. Anonymous FTP access will be offered.

Liaison and Collaboration

ERIN has negotiated mutually beneficial data exchange agreements with a number of data custodians. Through these arrangements, ERIN aims to coordinate the efforts of custodians with similar types of data with a view to distributed database retrieval. Funds have been made available

to herbaria around Australia for databasing activities, with the understanding that ERIN will have access to the products. This approach has been greatly appreciated by both State and Commonwealth agencies. However ERIN is cautious in its dealings in this area: particularly where custodian institutions wish to (or are obliged to) restrict the use of data. ERIN will ensure that appropriate systems administration security facilities are implemented.

Further information about the ERIN Program can be obtained from:

Director, ERIN
Australian National Parks & Wildlife Service
G.P.O. Box 636
CANBERRA A.C.T. 2601

or from the Scientific Co-ordinator, Biogeographic Information, Arthur Chapman (address at the head of this article).

4.11 INSECT INFORMATION INITIATIVES

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The widespread use of the personal computers and the potential for worldwide networking herald exciting times for the exchange of entomological data. However, at the present time, there is no central record of who is databasing which groups where. In an attempt to rectify this situation a brief questionnaire was circulated at the very recent International Congress of Entomology in Beijing, China and will be sent out via electronic mail to relevant user groups. This should provide a starting point for a database of entomological databases worldwide. The accessible/available databases containing entomological information known to me are discussed briefly below. I would appreciate information on any not mentioned.

ACCESSIBLE VIA NETWORKS

AGRICOLA
An on-line database covering all aspects of agricultural sciences, including agricultural entomology.

Agricultural Library Forum (ALF)
Covers all aspects of agricultural sciences, including agricultural entomology.

Biological & Agricultural Index
Covers life sciences, including entomology.

CAB ABSTRACTS - CAB International, Wallingford, OX10 8DE, U.K.
A comprehensive database from 1973 to the present of agricultural and biological information and contains all records in the 26 main abstract journals published by Commonwealth Agricultural Bureau. Over 8,500 journals in 37 different languages are scanned for inclusion, as well as books, reports, theses, conference proceedings, patents, annual reports, and guides. In some cases, less accessible literature is abstracted by scientists working in other countries. About 130,000 items are indexed each year. Significant papers are abstracted, while less important works are reported with bibliographic details only. The journals included in CAB cover the following subjects: agricultural engineering, animal breeding, animal disease, arid lands, dairy science, entomology, plant breeding, plant pathology, rural recreation and tourism, soils and fertilisers, weeds, world agricultural economics, and more. File 50 contains records from 1984 forward, file 53 contains records from 1972-1983. There are in excess of 2.8 million records and the database is updated monthly.

CSA Life Sciences Collection
Covers life sciences, including entomology.

Current Contents Search
Covers life sciences, including entomology.

Entomology Abstracts
Covers research on insects, arachnids, myriapods, onychophorans and terrestrial arthropods. Specific topics covered include new taxa, nomenclature and taxonomy.

FS-INFO
Covers forestry and resource management in the U.S., includes forest entomology.

International Soybean Arthropod Collection Database
Covers arthropods, including insects, associated with Soybeans.

Review of Agricultural Entomology
Covers agricultural entomology, including control of pests, disease and micro-organisms; pesticides; crop husbandry and management; field crops; forestry and forest products; taxonomy; morphology; genetics and sterility; geographical distribution; soil science; and weed biology and control.

Review of Medical and Veterinary Entomology
Covers Medical and Veterinary entomology, including control of pests, disease, and micro-organisms; animal health; morphology; physiology; ecology; geographical distribution; public health and hygiene; and taxonomy.

SIRS Science CD-ROM
Social Issues Resource Series Inc. (SIRS). Science and technology including entomology.

Soybean Insect Research Information Canter Database
Covers arthropods, including insects, associated with soybeans.

Yukon Bibliography (YKB)
Covers the Yukon Territory, including entomology.

Zoological Record On-line - Biosis, Philadelphia, PA, USA.
Provides worldwide coverage of zoological literature from 1978 to the present, with particular emphasis on systematic/taxonomic information. The database includes in excess of 1.3 million records and is updated monthly. The database includes 27 sections devoted to various animal groups, including protozoa, nematoda, insecta, pisces, reptilia, aves and mammalia. Approximately 6,000 journals are scanned to give comprehensive coverage of systematic zoology.

Citations in Zoological Record Online include basic bibliographic information, as well as the systematic classification of up to six levels for the biological organisms discussed.

AVAILABLE ON CD-ROM OR DISKETTE

CAB CD - CAB International, Wallingford, OXON, OX10 8DE, U.K.

This is a subset of CAB ABSTRACTS on CD-ROM. The CAB CD comprises three CD ROM diskettes each with about 400,000 records. The first covers 1984-6, the second 1987-9, and the third 1990-92. The Silver Platter Information Resource Software (SPIRS) runs on IBM, Apple-Mac and NEC 9800 platforms. The only difference between the CAB CD version and the on-line CAB ABSTRACTS is that the CD version searches on any word in the record rather than just author, title and keyword fields. Subsets of CAB CD are also available in selected disciplines or area as follows:- VET CD (Veterinary Science, 1973-90), BEAST CD (Animal Husbandry) 1973-91), HUMAN NUTRITION CD(1973-91), TREES CD (Forestry, 1939-91), and POLTOX CD (Environmental pollution and toxicology). Annual updates are available. Four further subsets are due this year:- CROP PROTECTION CD(1973-92), HORTICULTURE CD (1973-92), PLANT GENETICS CD (1973-92) and SOIL SCIENCE CD (1973-92). Amongst these TREES CD and the forthcoming CROP PROTECTION CD are of particular interest to entomologists.

CABIkey - Ian White, CAB International Institute of Entomology, 56 Queen's Gate, LONDON, U.K.

CABIkey is an interactive key program on diskette developed by Ian White, CAB IIE. It incorporates text and illustrations and is designed to be simple and adaptable for users. A demonstration diskette of the CABIkey system was produced to give potential purchasers of the product a chance to try out the product. The diskette includes a selection of the species that will be included in the planned system for the identification of Asian, Pacific and Australian species of fruit flies (Diptera: Tephritidae).

Samples of New Zealand science on CD-ROM. - Jasperse, J.A. (Ed.) 1992. Wellington, SIR Publishing. September 1992, 40Mb, $50.00. Trial CD-ROM - Limited Edition Only

This first New Zealand-authored CD-ROM is an electronic publishing experiment initiated by the editor of the New Zealand Journal of Marine and Freshwater Research, J.A. Jasperse. It contains 7 Romware databases in 3 groups: SILVER, THESIS (of Jasperse), and BUGS. BUGS includes 2 databases: BUGS-on-disc, and "Aboutbug", the text and figures from the companion printed publication (1992) "Bibliography of New Zealand terrestrial invertebrates 1775-1985, and guide to its associated information retrieval database BUGS", by G.W. Ramsay and T.K. Crosby, Bulletin of the Entomological Society of New Zealand BUGS-on-disc indexes all the available literature concerned with non-marine invertebrates of the New Zealand sub-region for the 210-year period 1775-1985. The database contains approximately 14,500 references to information in about 950 periodicals and numerous books, as well as about 750 theses and projects of New Zealand universities. Literature concerning both endemic species and those which are adventive or introduced is included: many of the introduced species from the Northern Hemisphere and Australia are pests of agricultural or horticultural significance, and form a significant proportion of the New Zealand economic literature.

4.12 INTERNATIONAL ORGANISATION FOR PLANT INFORMATION

[Presented on behalf of:] Mr. Alex George

IOPI Secretary, Australian Biological Resources Study,
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Today, despite the widespread utilization and exploitation of plant species, growing concerns about loss of biodiversity and the urgent need for conservation of genetic resources, there is no modern unified conspectus of the plant species of the world, their distribution and attributes. The problem has been addressed in part by the Species Plantarum Project and the Global Plant Species Information System groups. IOPI has been established to integrate and extend the work of these groups, and to replace them.

IOPI's objective will be to prepare such a conspectus as expeditiously as possible through the establishment of a series of integrated, dispersed, computerised databases which will summarize the basic taxonomic information, biological attributes and potential for utilization of all species, in the first instance, of all the vascular plants of the world; to document the data, and to make them accessible in a variety of ways for the benefit of a diversity of users. This is a major undertaking but an essential, minimal, first step will be to provide, as a fundamental framework, a World Vascular Plant Checklist. Thereafter, it will be possible to integrate further databases concerned with other attributes, taxonomic, biological, ecological, useful - whether to agriculture, forestry, horticulture, medicine, biotechnology or in other ways - or of relevance to conservation, around this Checklist.

This checklist project depends upon the voluntary collaboration of numerous botanical institutions and individuals worldwide. The urgent need for a checklist means that it should be completed as quickly as possible, and a timescale of 5-10 years has been mooted.

To achieve its objectives, IOPI has established a Checklist Committee, and a number of Working Groups, including the Information Systems Group, whose objectives include "to assist with communications and exchange of data".

IOPI will be represented at the Biodiversity Network Workshop by a member of the Information Systems Group. It is considered that the sharing of information and experience in planning and operating networks will prove beneficial to IOPI, and also to other Workshop participants.

4.13 IBPGR and the Biodiversity Network - Interest and Scope of Involvement

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Conservation and development are linked both biologically and logistically. Biological resources provide a basic tool for development; development provides the material means to conserve biological resources. The Consultative Group on International Agricultural Research (CGIAR) has always recognised that agriculture is a key to development and that the conservation and sustainable use of plant genetic resources is essential to agriculture. Plant genetic resources, the source of the vast variety of plant life upon which all other land life forms depend for subsistence, also provide the building blocks of agriculture which is the basis of all human economies. The International Board for Plant Genetic Resources Institute (IBPGR), the CGIAR centre most directly concerned with plant genetic resources, will continue to advance the knowledge required to ensure that the diversity of useful plants is safely conserved for future generations.

IBPGR is committed to solving the problems faced in the conservation and sustainable use of plant genetic resources for development and is ready to collaborate with national and regional programmes in identifying their needs and devising plans for action. IBPGR has been organised to provide competence, flexibility, objective and transparent decisions and accountability to both clients and donors.

IBPGR will act on priorities according to the urgency of the issues involved; the strength of demands from the plant genetic resources user community; the opportunities to maximise the benefits through international collaboration; and the potential for achieving the greatest impact globally.

Founded by the CGIAR in 1974 in response to international concern over the scale of genetic erosion and its negative impact on future plant breeding, IBPGR is soon to become the International Plant Genetic Resources Institute (IPGRI). The United Nations Food and Agriculture Organisation (FAO) provided headquarters and staff support for the launch of IBPGR, whose mandate was to promote and coordinate an international network of genetic resources centres to further the collecting, conservation, documentation, evaluation and use of plant germplasm and thereby contribute to raising the standard of living and welfare of people throughout the world. IBPGR grew from a small secretariat inside FAO to a sizeable institute operating under a Memorandum of Understanding on Programme Cooperation with its host organisation. This cooperation will continue after the transition from IBPGR to IPGRI.

Partnership will continue to be a major strength of the new organisation. In the coming years, IPGRI will be working with a rapidly developing plant genetic resources community. Its primary role will be to stimulate and support programmes conducted by other organisations. It will develop ways to collaborate with international, national, governmental, and non-governmental organisations, as well as scientific and development institutions, that have interests in plant genetic resources. Of these, national programmes are the basic building blocks of global efforts to conserve plant genetic resources. The way national programmes develop in the 1990s will be central to the successful conservation and use of plant genetic resources worldwide.

IBPGRs recently strengthened organisational structure will enable it to work more closely and effectively with its partners to achieve these objectives. IBPGR plans to reinforce its presence in the regions by consolidating its work in five geographic areas: Subsaharan Africa; the Americas; Asia, the Pacific and Oceania; Europe; West Asia and North Africa. The regional groups will develop and review IPGRIs strategic regional programmes, provide assistance to national and regional programmes, formulate and conduct research, collection, training, documentation, and information activities. The Rome-based headquarters is now organised into three major groups: genetic diversity; germplasm management and use; documentation, information and training.

Plant Genetic Resources Information

The rapid increase in plant genetic resources activity worldwide brings with it an expanding need for improved management of, access to, and exchange of information on all aspects of the subject, from the handling of data in genebanks to bibliographic services. To make the most efficient use of the scarce resources dedicated to increasing conservation and the use of genetic resources - and to avoid wasteful duplication of efforts - sharing of information is critical.

Three areas of information relate particularly to plant genetic resources: genebank accession information, bibliographic data and dissemination of new information. The greatest need is found in the national programmes of developing countries, where access to international information resources - essential for effective conservation activities and human resources development - is very limited.

Genebank accession information handling

Time and effort dedicated to the documentation of genebank accessions is a sound investment because it increases the efficiency of acquisition, exchange, and use of germplasm. Documentation is a crucial component of conservation because it increases the value of collected materials and enhances access by potential users. A plant breeder can be offered tens of thousands of seed samples of a particular crop. But without information about each sample, except when and where it was collected, it becomes a daunting task to search within the collection for useful characteristics.

Bibliographic data

Geographically diverse sources and users of information must have a means of accessing recent developments affecting their work. Rapid technological advances in plant genetic research generate large amounts of original information, all of which must be properly categorised, archived and made available to users everywhere. Worldwide coordination of effort requires the gathering together, collating and dissemination of bibliographic data on all information sources covering all aspects of the subject.

Dissemination of information

Information, however intrinsically valuable or painstakingly produced, is of little value if it does not reach the people who need it. The wide and timely spread of information assures minimal duplication of effort and accelerates the pace of research. It is hard to know when and where the plant genetic resources of one geographic area may be of use in another, though numerous examples show the importance of such exchanges. Greater dissemination of information increases the options and opportunities of all national programmes.

IBPGR and information

IBPGR maintains many different types of types of holdings of ex situ genetic resources collections held globally as well as related information. Included in the latter category are summaries of the activities of the ministries that are involved with genetic resources work on a country basis, genetic resources collecting missions, germplasm conserved ex situ and IBPGR ex-trainees. Most of this data is oriented towards agricultural species but IBPGR has recently expanded its informational activities into the area of forest and other woody species genetic resources. In addition, IBPGR has been, is and will be involved with many other organizations that hold data that is important in the work of the organization. IPBGR has worked very closely with FAO on the planning and development of the Global Information System for plant genetic resources and the production of the first State of the World's Genetic Resources. IBPGR continually answers queries from collaborators and clients on various aspects of genetic resources.

Biodiversity Network

The principal intention of IBPGR has been to act as a source for information regarding plant genetic resources without duplicating the efforts of other related programmes. This policy will continue for some time. The idea of a biodiversity network is important to IBPGR not only for access to additional sources of potentially useful data and information, but to enable a greater access and potential responses to the data and information that IBPGR maintains. This can provide IBPGR with insight into the extent and types of data and information that it possibly should be maintaining.

4.14 INITIATIVE OF THE MEXICAN INSTITUTE OF ECOLOGY: ACADEMIC NETWORK ON VEGETATION BIODIVERSITY OF LATIN AMERICA

L. Giddings and L. Gama

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English:
The Institute of Ecology, located in the city of Xalapa, state of Veracruz, Mexico, is hosting an academic network with an electronic bulletin board with information relevant to studies of the diversity of the vegetation of Latin America. This is an initiative designed to help researchers within Latin America work with each other in many ways, on both an institutional and an individual basis. The collaboration is visualised in many ways, including the establishment of common research objectives, international collaboration in projects, sharing of information, and communications between collaborators.

The Institute proposes to furnish a system of intercommunication, using Internet, although institutions and individuals can participate even though they lack a connection. It has established an electronic bulletin board service as a central point of communication. The Institute is currently connected to Internet via TELEPAC, the national packet network, but is establishing a faster connection that bypasses TELEPAC.

Espanol:
Iniciativa del Instituto de Ecologia de Mexico: Red Academica de la Biodiversidad Vegetal de Latinoamerica El Instituto de Ecologia, A. C., en Xalapa, estado de Veracruz, Mexico, esta implantando una red con una cartelera electronica que contendra informacion relevante a estudios de Biodiversidad Vegetal Latinamericana. Es una iniciativa para ayudar a los investigadores dentro de America Latina a colaborar en muchas formas, tanto institucional como individualmente. La colaboracion se visualiza en diferentes niveles, que van desde la fijacion de metas en comun, la realizacion de proyectos internacionales colaborativos, el manejo de informacion, hasta un formato de intercomunicaciones.

Aunque no es indispensable para la parte academica de la red, el tener comunicacion directa se propone facilitar las comunicaciones mediante Internet, comenzando con el establecimiento de una cartelera electronica como punto central. El Instituto tiene conexion a Internet mediante la red nacional TELEPAC, pero esta instalando una conexion con mas velocidad.

*Participacion subvencionada por el Subprograma Diversidad Biologica-CYTED-D del Programa Iberamericano de Ciencias y Tecnologia para el Dearrollo, de Espana.

4.15 THE MICROBIAL GERMPLASM DATABASE (MGD)

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Development and Implementation

Microbial germplasm utilized in plant research is a national resource of mounting proportions. Not only have many of us spent our careers in the study, isolation, and characterization of this germplasm, but considerable funds have, of necessity, been utilized in the development of this valuable asset. The microbial collections outside the major repositories such as ATCC and the ARS peoria collection, those we think of as working collections utilized in active, ongoing research, have been only recently recognized as valued repositories of genetic diversity and unique germplasm. No catalog or inventory of these organisms or reproducible elements exists. To fill that need, MGD was initiated with funding from USDA/CSRS.

Development of MGD and the online network was begun at Oregon State University by Moore and Hanus in 1989. This effort has to date identified more that 400,000 bacteria, fungi, viruses, fastidious procaryotes, entomophagous microorganisms, nematodes, cloned genes, viroids, algae, protozoa and other reproducible elements utilized in more than 400 labs associated with plant sciences and agriculture throughout the U.S.

In 1990 a catalog of that information was published and distributed to participants and administrators. A subset of the information from that catalog was placed in a prototype database searchable through Internet (a national network devoted to research and education) and telephone modem. This online database served to provide the testing ground for our network connections and, with the help of a number of researchers gave us the experience to tailor MGD to the needs of plant scientists. Having served its function, MGD's original prototyping computer system has been decommissioned to provide resources for an expansion and upgrade of OSU's biological computing facilities.

In 1992 MGD was funded for 2 years by an NSF grant to continue implementation of the database. We plan to to bring together the fast-moving technology of image analysis and transfer, major developments in distributed database interaction and the standardization of user interfaces to provide an easy-to-use database promoting exchange of germplasm and information and preservation of collections. Part of the objectives of MGD is to make images and graphics describing organisms, diseases, ecology and diagnostics as well as textual strain information readily available to scientists. Access to the system will be through a tiered front-end so that a user can choose whichever level of sophistication suits his/her needs, skills or equipment. The system should be usable by anyone with an Apple II, a Sun minicomputer, or any intermediate system.

While the grant was in review a number of major events occurred in computer science. A group of three major companies, Dow-Jones, Apple and Thinking Machines, Inc. released a public domain version of WAIS (Wide Area Information Server), a means of searching free-text databases in a distributed network environment. The network can be within a school or organization or it can be planetary. WAIS is capable of indexing and searching a large body of textual information using very sophisticated algorithms and providing a user with a large number of potential hits to a search.

Since WAIS breaks queries down to individual words the questions asked can be based on natural language. Such a natural language query could take the form of:

"Tell me about Pseudomonas syringae in vegetables from the Midwest USA."

The Wais server might respond with a cluster of articles, culture collections id's, investigators, pictures or even audio tracks or motion picture sequences, all ranked in order of goodness of fit to the original query. Should one of those be particularly relevant, s/he can then command the server to "find me more documents like this one". In this way a search which is initially quite broad can be continually refined and interesting paths can be easily followed to pull out pertinent knowledge from an extremely large and loosely structured base of heterogeneous data. Furthermore the user doesn't have to master the complex atabase language of structured queries. We are now prototyping the WAIS version of MGD.

Although WAIS and wais-like databases are an extremely efficient means of rapidly providing user access across a network to large and dissimilar bodies of information. They do not have the precision and exactness that one finds in the more traditional relational database management system (rdms). An rdms allows the use of logical operators such as AND, OR, EXCLUSIVE OR and NOT. Rdms's allow distinctions to be made based on how a text string is used in the database. For example, "stone" might be included in a name, an address, or a disease. Also, it is difficult to produce ordered lists from a wais-like database. Often mailing lists or catalogs of organisms would be an expected output of a database search and at this point, rdms handle these tasks much more efficiently. For these and other reasons, a relational database is a necessary adjunct to a free-text database.

In the last two years there has been substantial progress in interfacing rdms from one software vendor running on one platform with the rdms from another vendor on a different system. This facilitates development of the type of distributed network we envision. We are now developing a relational view of MGD that will provide the precise search strategies required for exacting queries. We plan to provide automated update of both the WAIS and rdms sides of MGD so that a user will be able to locate exactly the same information regardless of which approach, rdms or wais, that s/he uses.

Many of us have not been able to justify the addition of high resolution graphics, or our institutions have not yet provided the infrastructure for high-speed computer network access. MGD will be able to provide answers to queries from this community as well. The Computer Science Department at Oregon State University has developed ALMANAC, a very versatile e-mail answering program for the Oregon Extension Service. ALMANAC now provides market information, weather information, extension bulletins and other useful data to farmers and other agriculturists who have only a telephone modem and do not have access to high-speed networks. One of our collaborators is supervising the adaptation of ALMANAC to answer queries about microbial germplasm. An investigator who wants to know, for example, who might provide an answer to a question about culture of MPLO's, could e-mail the following question to ALMANAC and get back an almost immediate response:

SEND RECORDS MPLO FASTIDIOUS-PROCARYOTES

The response might well be a list of individual who are experts with the organisms and who would be willing to provide advice.

Testing, Refinement and Evolution

We are now at a stage where more data are needed from scientists who maintain working collections. To tailor data input systems to authentic situations, we are soliciting help, broadly from the community of plant scientists. We would be grateful to any of this constituency who would submit all or part of their collection data, regardless of format (though dBase III or text files would be preferred) for use in the database. We of course will not use any fields or information that the provider designates as in-house or proprietary. Furthermore the participant may remove all or part of the provided information should s/he choose to at a later time.

We, thus far, have collection information from such divergent groups as the Fungal Genetics Stock Center's Aspergillus and Neurospora databases, the Nematode Database developed at Ohio State University, Cleo D'Arcy's Virologist Database, Michael Castellano's Endo- Ecto- mycorrhizal Collection (which includes much of Norman Schenck's former collection from Florida), the California Department of Food and Agriculture Bacterial Collection, the microbial collection of molecular biologist, Dave Coplin, and Larry Moore's Agrobacterium and Pseudomonas collection. Anne Alvarez, who maintains an extensive collection of Xanthomonas as well as monoclonal antibodies has consented to cooperate. Each of these databases has a unique data structure and serves a different audience. The diverse community supporting development of MGD is affirmed by the inclusion of not only basic research collections, but also by the participation of Dennis Mayhew of the California Department of Food and Agriculture, an agency with not only a role in pest identification but also in regulation of both intra- and interstate movement of microbial germplasm.

The WAIS approach allows us to get up-and-running with data which is structured in these different formats. Analysis of the structures of these databases, and the nature of queries formulated by scientists through WAIS will promote more effective development of the highly structured tables required for a relational database.

Expectations for the the Workshop

I appreciate the fact that microorganisms have a prominent position in the materials that you e-mailed me about the workshop. Such positioning has not always been the case in my experience. Unfortunately, microorganisms frequently are treated as 2nd or 3rd class citizens, or less, when they are considered in the same program with animals and plants. My concern is how the workshop will be partitioned to assure that microorganisms are given proper balance relative to their significance and contribution within each group of organisms.

A second point is the importance of seeking bench-scientists' participation and evaluation of any proposals that are developed from the workshop to encourage their feeling of ownership and commitment to the effort. From the perspective of the Microbial Germplasm Database, which deals primarily with diverse large and small research oriented collections the cultivation of this perception of collective ownership and benefit is essential to success in development.

Many of the key areas for exploration at this workshop are represented in the introductory materials sent to potential participants of the workshop; e.g. what has and is being done, what is available, what is the role of commercial, academic and government agencies, what are the political considerations (especially where national boundaries are crossed), who will accept sponsorship and funding for the effort, what will be the mechanics of operation? What, if any, inducements are needed to encourage broad participation in this endeavor?

Another concern is how best to encourage the private sector to participate in the process beyond merely being a consumer of relevant information and important genetic resources.

As we consider the mechanics of operation of any future effort, we should keep in mind that each database has its own unique needs, assets, objectives, and probably its own funding. To attempt to homogenize each of these into a consistent format would destroy part of their utility which derives from their uniqueness. Even though every database is independent, and their structures are diverse, each one can be searched concurrently from a network environment using programs such as WAIS system (Wide Area Information Server) developed by Thinking Machines, Inc. and which is being tested at numerous sites in the U.S. and in Europe. The linkage of databases using a system such as WAIS is as much philosophical as electronic, i.e. it is based on a common system of key-word indexing and not on common data structures or common hardware configurations. Other systems for information exchange are being developed using abstract syntax notation (ASN.1), which has been accepted by ISO as a protocol for transmitting information that is independent of both platform and software.

Lastly, I think it would be effort well spent for the group to spend time at some point in the workshop brainstorming and articulating ideas that strengthen the justification for linkage of these different databases.

4.16 NETWORKING EXPERIENCES OF MIRCEN-STOCKHOLM

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BACKGROUND

MIRCENs is the acronym for Microbial Resources Centre, a concept that was conceived by the United Nations Environment Programme (UNEP) in 1973 and implemented with technical and financial support from UNEP and UNESCO. There are 24 MIRCENs in 20 countries and they are academic and/or research institutes in the developed and developing countries. Together they form the MIRCENs Network on Environmental, Applied Microbiological and Biotechnological Research. Some of these MIRCENs may have their own regional network of collaborating laboratories or co-MIRCENs. MIRCENs, in co-operation with the concerned National Commissions of member States and government authorities, participate in a global collaborative network effort in the harnessing of the beneficial applications of the microbial world for environmental management and human wellfare through the vehicle of international scientific co-operations.

The global MIRCENs network programme embodies research and training programme that are carried out in the framework of UNESCO's and UNEPs regular/participation and extrabudgetary programme activities. The primary aim of the MIRCEN Network is to preserve microbial germ plasm with a world-wide programme to:

* provide a global infrastructure which would incorporate national, regional and inter-regional co-operating laboratories geared to the management, distribution, and utilization of the microbial gene pools
* reinforce the conservation of microorganisms, with emphasis on Rhizobium gene pools, in developing countries, with an agrarian base
* foster the development of new inexpensive technologies native of specific regions
* promote the economic and environmental applications of microbiology
* serve as focal centres in the network for the training of manpower

The focus areas of MIRCENs may be in envrionmental management, agriculture, biotechnology and informatics. MIRCENs in regions that have agrarian-base economies focus on agriculture with special emphasis on nitrogen fixation, bioconversions of agricultural wastes to food, fodder, fuels, fertilizers and on bioinsecticides. Because biotechnologies can improve health and environmental quality, many MIRCENs considered it as an avenue to strenghten their national economies. These MIRCENs focus on biotechnological processes for fermentation of biochemicals, bioremediation and pollution abatement. Others deal primarily with the handling of data on microbial strains or management of information or networking by computer.

Current MIRCENs are:

Country	Location	Director/Research on
Argentina	Planta Piloto de Procesos	Prof. Faustino Sineriz

	Industriales Microbiologicos (PROIMI), Tucuman	LAB-silage, bnf, ethanol, CH4, yeast genetics
Australia	Dept of Microbiology, Univ. of Queensland, Brisbane	Prof. Horst W. Doelle fermentation technology, LAB
Brazil	Instituto de Pesquisas Agronomicas, Porto Alegre	Prof. J.R. Jardim Feriere bnf, starter cultures, bioinsecticides, bioremediation, training
Canada	University of Waterloo, Waterloo	Prof. Murray Moo-Young training bioengineering & industrial biotechnology
	University of Guelph, Guelph	Prof. B. Cox agricultural biotechnology
China	Institute of Microbiology, Academia Sinica, Beijing	Prof. D.K. Song mushrooms, bnf, bioinsecticides bioremediation
Hong Kong	Chinese Univ of Hong Kong (co-MIRCEN)	Prof. S.T. Chang mushroom, culture collections
Egypt	Ains Shams Univ. Cairo	Prof. M.N. Magdoub culture collections, bnf, training, ethanol production, biofertilizers
Germany	German Collection of Microorganisms and Cell Culture Braunschweig	Dr. D. Claus culture collections
Guatemala	Central American Research Institute for Industry, Guatemala City	Prof. Carlos A. Rolz bioinsecticides, ethanol production
France	Centre de Transfert, Toulouse	Prof. G. Goma training, research cooperations with Afican countries
Hungary	Univ of Horticulture and Food Industry, Budapest	Prof. T. Deak culture collections, patents
India	M.A.C.S. Institute Pune	Prof. A.D. Agate biogeotechnology
Japan	Univ of Osaka Osaka	Prof. Y. Oshima training, fermentation technology
	World Data Centre,	Dr. Hideaki Sugawara

	RIKEN Tokyo	databases, culture collections
Kenya	Dept of Soil Sciences and Botany Univ of Nairobi Nairobi	Director Culture collections, bnf, training, starter cultures
Senegal	Centre National de Recherches Agronomiques, Dakar	Prof. M. Gueye bnf, training, culture collections
Sweden	Karolinska Institute, Stockholm	Mr. E.L. Foo & Prof. C.H. Heden networking, computer conferencing on agriculture, medicine & biotechnology
Thailand	Thailand Inst of Scientific and Technological Research Bangkok	Prof. P. Atthasampunna culture collections, waste treatment, CH4, bioconversion, bnf, bioinsecticides
Trinidad & Tobago	Caribbean Industrial Biotechnology Research Institute Tunapuna	Dr. Desmond Ali biotechnology
U.K.	C.A.B.International Mycological Institute, Surrey	Dr. D. Allsopp training
	International Institute of Biotechnology Canterbury	Prof. D.J. Hardman training
U.S.A.	NifTAL Project, University of Hawaii, Paia, Maui	Dr. Padma Somasegaran culture collections database, training, bnf
	Cell Culture and Nitrogen Fixation Laboratory, Beltsville	Prof. P. van Berkum culture collections, training, bnf
	Marine Biotechnology Institute College Park Maryland	Prof. Rita Colwell advanced biotechnology, marine biotechnology
Yugoslavia	UNESCO International Centre for Chemical Studies Ljubljana	Prof.A. Kornhauser Biotechnology Information Exchange System (BITES)

MIRCEN AT STOCKHOLM

MIRCEN-Stockholm is the Scandinavian MIRCEN and was established in 1976 as a biotechnology MIRCEN for the development of microbiological techniques. The research group, led by Prof. Carl-Goran Heden, have conducted work on the cultivation of algae, single cell protein production,

automated systems for the biochemical identification of microorganisms, methanogenic anaerobic digestion, biological nitrogen fixation, biological waste treatment, etc. After Prof. Heden's retirement, his successor, Mr. Eng-Leong Foo, concentrated on networking by computer conferencing and electronic mail and established MIRCEN- Stockholm as an "informatics" MIRCEN. E-mail is used as the primary method of communication for the networking of people and efforts are directed towards :

(a) encouraging and helping scientists to access local e-mail facilities in both developed and developing countries;

(b) organizing discussions via computer conferences, workshops, seminars, online computer conferences, and forums on topics of interests to the MIRCEN network;

(c) identifying information and human resources;

(d) developing cooperations on networking with other organizations.

Several types of activities have been organized by MIRCEN-Stockholm since 1983. These activities were aimed to demonstrate the benefits of computer conferencing and to encourage biologists to use computers for communication with other geographically dispersed groups of scientists. Before mail transfers via academic networks like Internet were available, participants were required to logon via IPSS or direct dial telephone line to a conferencing system (either EIES, USA; QZCOM, Sweden; CoSy, Canada; PROFF,Thailand) in order to participate. Mail transfers were manually uploaded to conferences at participating systems until MAILNET and ARPANET became available.

Types of Activities

MIRCEN-Stockholm has organized or co-organized the following types of activities:

(A) Bulletin Boards/Computer Conferences/Lists

Bulletin boards and computer conferences are basically mailboxes at a host where all users must logon in order to read and/or write. A mailing List (sometimes also referred to as a bulletin board) uses a listserver to redistribute messages it receives to subscribers as e-mail at their local hosts.

1983: International Computer Conference on Bioconversion of Lignocellulosics for Fuel, Fodder and Food needed for Rural Development in Poor Countries, available in EIES and QZCOM. Participants ended the computer conference by meeting for a week at different cities in the world (Stockholm, Massachusetts, Guelph, Frankfurt, Manila, etc).

1984-1986: "MIRCENET", a conference in QZCOM for information dissemination by UNESCO's MIRCEN Network on Environmental, Applied Microbiological and Biotechnological Research and for communication among its members and other organizations.

1984-1989: "Anaerobic Digestion Mircen", a series of conferences in QZCOM and later in CoSy conferencing system (Canada) for information exchange and discussions on methanogenic anaerobic digestion.

1985-1986: International Computer Conference between Indonesian and Canadian Universities, a conference in CoSy that permitted scientists from several Canadian and Indonesian universities to discuss various common topics in research and development.

1987: Impacts on Biotechnology Conference, in EIES, CoSy and QZCOM, organized in cooperation with the World Academy of Arts and Science for discussions. A new theme was discussed every 2 months.

1988: "1ACC" a series of computer conferences for the 1st AIDS Computer Conference in QZCOM with mail distribution via EARN to subscribers of the lists "AIDSNEWS" and "STOCKAIDS".

1989-1990: List ID: BIOCONV@IRLEARN
List Title: Bioconversion Forum
A mailing list available via the BIOSCI International Bulletin Boards Network for information exchange and discussions on bioconversion of biomass into food, fuel, fodder and fertiliser with emphasis on integrated systems in developing countries.

1990- : List ID: BNFNET-L@FINHUTC
List Title: Biological Nitrogen Fixation Forum
Mailing list for members of UNESCO's MIRCEN Biological Nitrogen Fixation Electronic Network. BNFNET aims to foster better communication through the exchange of information, experiences and scientific results on bnf, and to stimulate cooperations among its bnf MIRCENs and between MIRCENs and other organizations. The list provides information (meetings, news and profiles of research and commercial organizations, scientific publications) and conduct discussions on legume-rhizobium symbiosis, nitrogen-fixing trees; genetics/biochemistry; free-living nitrogen fixers; culture collections and computer networking. An annual meeting of members is held for evaluation of programme and discussions of research presentations (1991: 1st BNFNET Computer Conference, Aug-Sept) ; 1992: 2nd BNFNET Computer Conference, planned).

1992- : List ID: LACTACID@SEARN.SUNET.SE
List title: Lactic Acid Bacteria Forum
A mailing list created in cooperation with Biofocus Foundation's (Stockholm) for information exchange and discussions on the biology and uses of lactic acid bacteria for the health of humans and animals, preservation of foods & animal feeds, production of bichemicals, etc.

1992- : List ID: DIARRHOE@SEARN.SUNET.SE
List title: International Forum on Diarrhoea
A List created in cooperation with Karolinska Institute (Stockholm) and provides a forum for scienitific communications related to diseases, disorders, and chemicals which cause diarrhoea in humans and animals.

(B) Online conferences

Online conferences (also known as electronic extensions of face-to-face meetings) provided abstracts of papers and posters to online members several weeks before conference participants would gather at a symposium site. Such online conferences were aimed at providing opportunities to junior scientists and to researchers without travel funds to interact with experts and other conference participants. Eight such online conferences were arranged for:

1984: International Conference & Exhibition on Bioenergy 84, Gothenburg, Sweden.
1985: 2nd EC Conference on Energy from Biomass, Venice.
1985: National Finnish Seminar on Methane Fermentation, Joensuu.
1986: Global Impacts of Applied Microbiology VII, Helsinki.

1986: EC Meeting on Anaerobic Digestion, Villeneuve Q'Ascq, France.
1986: 4th International Conference on Microbial Ecology, Ljubjlana, Yugoslavia.
1987: 8th Miami International Conference on Alternative Energy Sources, Miami.
1988: 4th International Conference on AIDS, Stockholm, Sweden.

(C) Computer Workshops/Seminars

These are special activities which may be task-oriented discussions for information collection (e.g. inventory of rhizobium inoculant producers) or discussions (role of biogas digesters in integrated farming systems; Biogas technology in Tanzania).

LESSONS LEARNED

The process of recruiting people to participate in a computer conference or a forum can be very time-consuming. This was particularly true in the early 80's when the use of computers for messaging was limited to small groups of biologists in some developed countries. The lack of local facilities also required scientists to logon to facilities that were located elsewhere or abroad. IPSS charges for connecting to conferencing systems were prohibitively expensive to most scientists in developing countries when it was used for day-to-day communications. However, in the past few years, developments in computer networking and the extensive installation of e-mail facilities in most universities of developed countries and in many developing countries have favoured significant changes in the attitudes of using e-mail for day-to-day communications. Another major contributor to this change was the development of the listserver software which enables the rapid re-distribution of messages from a list to its subscribers.

Mailing lists can be used for numerous purposes and are most frequently used for the dissemination and collection of information, for conducting discussions and posting announcements. Lists on general scientific topics are rapidly being created but there is still a lack of lists on specialised topics. This is bound to change in the next few years. The establishment of a Biodiversity Information Network will certainly hasten the process as lists for information exchanges on single animal/plant species or functional types of plants and microbes might be needed by specialised working groups.

Managing a mailing list usually does not require much effort but moderating and maintaining the activities of a list, such as one for a forum, is a challenging task. There is a constant need to identify and recruit new members until the forum becomes "self-organizing", i.e. when the number of active participants are large enough so that there is little chance for a week to pass by without any message exchanges. Once this state is achieved, participants will be spontaneous in sharing information and in helping to answer queries. Before attaining that state, the majority of members will be passive and will read messages in the same way as they would do a hard-copy issue of a newsletter. To help members pass through this transition is not easy or simple and few list moderators have achieved it.

Access to information in commercial databases is still largely limited to information specialists who help biologists with their needs in many countries. Several databases that can be reached via INTERNET free of charge are still unavailable to users who do not have TELNET or FTP connections. However, database server softwares now exists which can provide an interface for e-mail users to access databases. Users require only to send a message containing specific instructions to a database server which then conducts a search and sends the results to the users by e-mail. Such database servers would increase access of databases and encourage better cooperation in the sharing of information.

Future efforts of MIRCEN-Stockholm will be centered on sharing the experiences its has gained and in developing cooperations with other organizations on networking activities which will provide access to information sources and participation by MIRCENs and other scientists in developing countries.

4.17 NETWORKING ACTIVITIES AT MIRCEN-STOCKHOLM

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BACKGROUND

MIRCEN-Stockholm is a member of the Microbial Resources Centers (MIRCENs) Network on Environmental, Applied Microbiological and Biotechnological Research. There are 24 MIRCENs in 20 countries, some MIRCENs may have their own regional network of collaborating laboratories. The primary aim of the MIRCEN Network is to preserve microbial germ plasm. The focus areas of MIRCENs may be in environmental management, agriculture, biotechnology and informatics. The MIRCEN at Stockholm was established in 1976 as a biotechnology MIRCEN for the development of microbiological techniques but since 1983 it has concentrated on networking by electronic mail and computer conferencing.

MIRCEN AT STOCKHOLM

E-mail is used as the basis method of communication for the networking of people. MIRCEN-Stockholm manages electronic mailing lists of specific topics that are of interests to the MIRCEN Network. Other efforts are directed towards :

(a) encouraging and helping scientists to access local e-mail facilities in both developed and developing countries;

(b) organizing computer workshops, seminars, online computer conferences, electronic extensions for face-to-face meetings and forums on topics related to bioconversion (fuels, food, fodder, composting, biofertilizers), integrated agricultural systems, anaerobic digestion, biological nitrogen fixation, starter cultures;

(c) identification of information and human resources;

(d) development of cooperations with other organizations, e.g. with (i) Karolinska Institute <International Forum on Diarrhoea>, (ii) Biofocus Foundation <Lactic Acid Bacteria Forum, planned: mushroom network>, (iii) UNIDO <proposed: e- mail component of the International Lactic Acid Fermentation Network>, (iv) Baltic Eco Association <proposed: networking of research partners>

CURRENT NETWORKING PROJECTS:

Biological Nitrogen Fixation Electronic Network BNFNET was established in 1990 by the MIRCEN Network and managed by MIRCEN-Stockholm, in cooperation with the co- MIRCEN in Finland and NifTAL-MIRCEN in Hawaii. BNFNET aims to foster better communication through the exchange of information, experiences and scientific results on bnf, and to stimulate cooperations among its bnf MIRCENs and between MIRCENs and other organizations. Members use an electronic mailing list (BNFNET-L@FINHUTC) for their daily communications and interact by providing information (on forthcoming meetings, news and profiles of research and commercial

organizations, scientific publications) or conduct discussions. There are 6 informal discussion groups for Legume-Rhizobium, Nitrogen-Fixing Trees; Genetics/ Biochemistry; Free-Living Nitrogen Fixers; Culture Collection and Computer Networking). BNFNET has 105 members (June 30th. 1992) from about 30 countries.

Lactic Acid Bacteria Forum

The project was established (April 1992) in cooperation with Biofocus Foundation's "starter culture program". All members are interlinked via a mailing list (LACTACID@SEARN.SUNET.SE) which is used for information exchange and discussions on the biology and uses of lactic acid bacteria for the health of humans and animals (e.g. probiotics) and production of fermented foods (vegetables, dairy products, fish and meat, starchy substrates), animal feeds (silage), polysaccharides (e.g. dextran), etc. A collaboration with UNIDO who plans to establish an International Lactic Acid Fermentation Technology Network has been proposed.

International Forum on Diarrhoea

The project was established in May 1992 with Karolinska Institute (Stockholm) and provides a forum for scientific communications related to diseases, disorders, and chemicals which cause diarrhoea in humans and animals. It currently has 54 members (June 1992). Cooperations with international programmes on diarrhoea and research centers will be proposed.

4.18 DATABASE STRATEGY AT THE NATURAL HISTORY MUSEUM, LONDON

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The Natural History Museum (NHM) has embarked on a strategy of consolidating its database effort. The goals of the strategy are to rationalise data structures, improve communication, strengthen analytical procedures and increase the efficiency and security of data handling. In this way broader questions can be asked of the data and more general issues can be addressed.

To this end the NHM has invested in information technology including workstations, file servers, intelligent character recognition systems and geographical information systems (GIS). Key skills are being bought in through recruitment, particularly in the GIS area. The NHM will invest a further L1.5 million in IT technology over the next 5 years.

* A Museum-wide network is currently being installed, with connections to national and international networks. It will link more than 200 computers currently in use in the organisation and allow for planned expansion. The system will lead to increased efficiency of collection management and associated information services plus extra security through centralised archiving.

* A geographical information system will provide an analytical facility for collection and taxonomic information. It will be possible to formulate questions based on spatial, temporal or environmental parameters and obtain informative responses from the system.

* Methods for automated extraction of data from the collections and library are being developed with the objective of unlocking the vast resource of information and to increase its availability to decision-makers, particularly in the environmental field. The value of specimens lies in answering questions of world-wide significance and as a major resource for understanding how the natural world is functioning and has functioned over time.

The Natural History Museum databases currently handle information on plants, animals (both extant and fossils), minerals and even extra terrestrial material in the form of the meteorite collection. Though there are currently some 80 science database projects with approaching 1 million records, this is a small subset of the information potentially available from the Museum's collections of 67 million specimens, amassed over four centuries, and perhaps the most comprehensive natural history library in the world.

4.19 NETWORKING AT THE NATURAL HISTORY MUSEUM, LONDON

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Introduction

The collections at the Natural History Museum (formerly the British Museum (Natural History)) are among the largest and most comprehensive in the world and comprise an estimated 67 million specimens.

Databasing these vast collections began in 1970 with the mammals and was followed in 1973 by the fossils. Later, in 1976 a collection index and world list of meteorites was started. It was not, however, until 1978 that the botanists and until 1980 that entomologists began databasing their collections.

Today databases exist in all departments of the Museum and include indexes to more than 20 collections comprising over 110,000 records ranging from primates, rodents, fleas and flies to diatoms, vascular plants, minerals and fossils. Although nematologists, paleontologists, mineralogists and botanists database individual specimens, entomologists, because of the vast numbers of specimens in their care - an estimated 27 million, database only taxa routinely. There are, however, several research databases which include data on individual specimens in the collections e.g. British leaf-mining flies, British drosophilid flies and British tachinid flies.

The largest collection databases include the genera and species of Diptera or flies (54,798 records), the genera of Coleoptera or beetles (24,337 records) and the genera and species of Cicadellidae or leaf hoppers (6,252 records).

The European Plant Information Centre based at the Museum currently has some 84,000 records of names of taxa (including synonyms); the parasitic worms host/parasite catalogue comprises some 76,000 records; the Paleontology database includes over 19,000 specimens in 43 catalogues; and the combined collection index and world list of meteorites includes some 8,150 individual specimens.

In addition to the collections indexes there are several specialised bibliographies, including those for the medically important mosquitoes, black flies and sand flies which transmit malaria, onchocerciasis and leishmaniasis respectively (8,342 records) and the flora of central America (7,000 records).

All of the various databases are on individual personal computers currently unlinked by a network. However, networking of the entire museum is currently underway and there are plans to generate a central Museum-wide database.

Electronic Mail

A limited electronic mail service has been available at the Natural History Museum, courtesy of Imperial College, for some years. The service operates via an internal PAD communications computer to Imperial College and thence, through one of their VAX computers, to JANET (Joint

Academic Network) and other networks around the world using KERMIT. However, the PAD link is being withdrawn this summer.

In preparation for this withdrawal, the Museum has installed an ethernet backbone, which will use a fibre-optic link through to Imperial College. At the same time the opportunity to link other users within the Museum was taken, bearing in mind that data exchange is becoming ever more important in today's world.

The Museum Network

In addition to a SUN server and a CISCO AGS+ "router" in the Museum's Biometrics Unit to control network traffic, eleven distribution points including fibre-to-copper converters have been installed in the numerous buildings on site.

Local ethernet (copper) wiring from the distribution points is currently being installed to serve some 250 potential users throughout the Museum.

Testing of the network has started with those already linked. It is anticipated that most of the system will be up and running by the end of September.

Initially services offered will be internal and external electronic mail with access to JANET and thence other networks using public domain software - POP Mail, NCSA Telnet and FTP.

As the system develops, access to the Museum's Department of Library Services (DLS) catalogue and other Museum information held on the DLS's URICA system on a McDonnell-Douglas computer will be established. It is likely, however, that the DLS catalogue will be migrated to a UNIX system in the near future to increase resources and allow links with the network and a central Museum Database.

A Sun 630 file server running Informix is installed and IPX workstations are being installed for running Geographical Information Systems (ARC/INFO and Atlas) and Remote Sensing (ERDAS) applications. Collaborative GIS projects combining specimen-backed data with literature and field observations are already established with the World Conservation Monitoring Centre and the University of Florence.

It is anticipated that additional SUN servers will be installed in the other Science Departments in the next 2-3 years.

The Diptera & Siphonaptera LAN

In Entomology, the Diptera and Siphonaptera collection's databases, currently in Dataflex 2.3, are accessible on an internal DNA Equinet local area network (LAN). The databases serve as an index to the 54,798 species of flies and 1,893 species of fleas and type material present and their location in the collection. The Elonex 486 file server is linked to five PC workstations.

It is anticipated that the DNA Equinet network will be replaced by the Ethernet network and link to a central Museum-wide database (via an Entomology Department SUN server) in the next two or three years.

4.20 SCIENCEnet

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SCIENCEnet is a collaboratory, a communications and working environment for researchers in the earth and environmental sciences from over 50 countries.

As well as Europe, Japan and North American, participating scientists come from Brasil, Peru, Chile, Argentina, Trinidad & Tobago, Russia, Ukraine, Bulgaria, Bahrain, Kenya, New Caledonia, Philippines, Taiwan, and the People's Republic of China.

In addition to private messaging, SCIENCEnet offers a wide array of services and working tools for scientists, including hundreds of electronic mailing lists and over a hundred bulletin boards and forums on specialized topics as diverse as El Nino/Southern Oscillation, acoustic reverberation techniques in ocean science, paleoceanography, coral reefs, aspects of climate change, experiments in progress, data bases being created.

SCIENCEnet is managed by Omnet which provides the full customer support necessary to overcome technical problems, including those involving the subscriber's own computer set-up and software.

SCIENCEnet subscribers tend to be involved in oceanography, climatology and environmental studies, but marine biologists and fisheries people are also well represented. SCIENCEnet would be of most interest to biodiversity people who are working in the marine environment. Changes in the marine environment are having a profound effect on biodiversity. Perhaps the easiest way to create a biodiversity dialogue involving many different specialized services would be to establish a secretariat with accounts on each of the different systems. Each service could then have a forum or bulletin board dedicated to biodiversity. The secretariat would then capture messages from one service's forum and post them on other services, when appropriate. In our opinion, human intervention is essential. Automated systems would indiscriminately forward everything to everyone along with a lot of 'junk'. Among networked scientists a common complaint is information overload and the amount of 'junk' they have to wade through. There is no substitute for intelligent information stewardship which is in touch with its constituents' needs and interests. Such a secretariat could also maintain information on how to send messages between the various systems and help trouble-shoot intersystem problems. Should the Brasil Network Workshop wish to discuss this concept with us, Omnet hopes to be available on-line. Here is a small sample of the bulletin boards and forums on SCIENCEnet: BAIKAL: To share information about research at Lake Baikal in Siberia. BENTHOS: Forum for the sharing of ideas, news and information by researchers working in the coastal, deep ocean and freshwater benthos. This board is intended to facilitate communication among bethic scientists. COASTAL.NEWS: For communication regarding CoOp (Coastal Ocean Processes), an organization dedicated to planning interdisciplinary coastal ocean research. CORAL.REEF: For the exchange of information on episodic or complex phenomena, mass mortalities, coral bleaching events, meetings, symposia, job openings, and for sharing environmental data. DOM.NEWS: For those interested in the analysis of dissolved organic matter (carbon, nitrogen, or phosphate) in aquatic systems. ENSO.INFO: El Nino-Southern Oscillation

Information. To trade ideas and data on the state of the tropical Pacific Ocean and Atmosphere. ERF.NEWS: Information about the Estuarine Research Federation and its affiliate societies. EURASLIC: Board of the European Aquatic Sciences Libraries and Information Centres. Announcements, jobs, publications, meetings, news, loan requests. GULF.MEX: News and information of interest to researchers working in the Gulf of Mexico region. This board is intended to foster cooperation and the sharing of regional resources. IAMSLIC: Board of the International Association of Marine Science Libraries and Information Centers. Announcements of general interest to members and others, including jobs, grants or awards, publications, meetings, etc. JGOFS.NEWS: Joint Global Ocean Flux Study information board. International counterpart to US.JGOFS.STATUS. OPEN.NEWS: A source for news and information regarding the business of the Ocean Production Enhancement Network, a network of biological and physical oceanographers, physiologists and geneticists working to enhance Canada's fishing industry. SE.US.COAST: To announce findings, coordinate activities and facilitate data exchange for research adjacent to the SE coast of the U.S. WOCE.TOGA.STATUS: Calendar updates, reports and general information concerning the U.S. contributions to the World Ocean Circulation Experiment (WOCE) and the Research Programme on the Interannual Variability of the Tropical Ocean and Global Atmosphere (TOGA).

4.21 THE BIOLOGICAL INFORMATION RESOURCES AT UNIDO AND ICGEB

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ICGEBnet is a computer resource maintained at the International Centre for Genetic Engineering and Biotechnology (ICGEB) in Trieste, that can be accessed through remote login from 45 countries world wide. The service includes on-line access to databases through an international computer link, bulletin boards, electronic mail, and a host of freely available PC software. ICGEB is part of EMBnet, the informatics network of the European Molecular Biology Organisation. Sequence analysis is provided by the Intelligenetics Suite of programmes, as well as FastA [similarity search], Phylip [sequence phylogeny analysis], CLUSTAL [multiple alignment] and a host of other programmes installed on a SUN 4/390 computer. ICGEBnet is specializing in search methods for distant protein sequence homologies. It maintains SBASE, a library of protein domains with over 24,000 entries and are developing methods based on parametric representation and Fourier analysis. In addition, a project has been initiated linking ICGEBnet to the databases currently available or being compiled by UNIDO's Biotechnology and Genetic Engineering (BGE) Unit. The latter, following requests from a number of countries and the work of the Informal UNIDO/WHO/UNEP/FAO Working Group on biosafety, is in the process of setting up a computerized decision support environment for the release of GMOs into the environment.

The project involves the establishment of:

1. A referral system for national regulatory authorities, national and international biosafety standards, guidelines and regulations.

2. An inventory of information resources, the type of data they host (e.g. data on physiology, molecular biology and ecology of the organisms in question, the conditions of their release and their target ecosystems) and ability to direct enquiries to potential sources of information through a central communications gateway.

3. In-house expertise in providing advice to developing countries, for drawing national regulations and setting-up institutional biosafety committees.

The project draws on existing strengths, such as the Referral Database on Energy and Environment (REED) established by UNIDO's Information Section (INTIB). The project aims at building-up in-house databases of:

national and international biosafety regulations
international experts
industrial containment standards for the use of genetically modified microorganisms
bullet environmental releases of transgenic organisms.

These databases will be regularly updated and it would be desirable if they were to be linked with the information resources of other international agencies and organizations, eg. FAO, WHO, UNEP and OECD, which have compiled similar data as a result of their activities. The implementation

of the project also provides for the integration of commercial and/or public domain expert system software utilized in risk evaluation. In addition, the establishment of a computerized communication's gateway will enable scientists, regulators and industrialists in developing countries to access the UNIDO and ICGEB databases as well as others, for example, those hosted by OECD (BIOTRACK) and IRRO. The in-house databases, coupled with a communications facility, as described above, will serve as an integrated knowledge support environment. They will assist in the decision making process of national regulatory authorities and expert panels, assessing biotechnology risks.

4.22 WORLD DATA CENTRE

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1. Non commercial network

In Japan non-commercial networks based on TCP/IP protocol are expanding quickly. Many scientists in universities and research institutions are able to use the networks which are connected to INTERNET. That is, scientists in Japan are able to directly access, for example, GenBank in US without dialing.

TCP/IP networks provide:

- exchange mail among users and host computers
- direct search of remote databases
- execution of jobs in remote hosts such as super computers
- transfer of files by FTP protocol
- download files from anonymous FTP hosts
- development of distributed databases

The names of Japanese networks are WIDE, TISN, and HepNet. Networks of non-TCP/IP like BITNET and NACSYS are also available.

2. Information resources

The World Federation for Culture Collections (WFCC) sponsors the WFCC World Data Center on Microorganisms (WDC) which used to be in Australia. WDC is now in RIKEN in Japan and makes on-line databases open to the public.

The databases are:

- CCINFO: a directory of culture collections of microbial strains (~400 collections are registered)
- STRAIN: a list of the names of 50,000 species held in the collections
- ALGAE: a World Catalogue of algal strains held in 33 algal collections around the world
- IRIS: a bibliographic database in the field of plant tissue and cell cultures
- HDB: a database on hybridomas and monoclonal antibodies. In addition, the following databases are planned:
- JCM and IFO: a database on strains held in Japan Collection of Microorganisms and Institute of Fermentation, Osaka
- JFCC: a list of holdings in collections in Japan
- ANIMAL: a database on experimental animals available in Japan.

WDC is accessible via non-commercial networks such as INTERNET and commercial networks such as MSDN, SPRINT and TELNET.

4.23 THE WORLD FEDERATION FOR CULTURE COLLECTIONS (WFCC): A NETWORK OF SPECIALIST MICROBIOLOGISTS

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The WFCC is a sector of the International Council for Scientific Unions (ICSU) concerned with the collection, authentication, maintenance and distribution of cultures of microorganisms and cultured cells. Its aim is to promote and support the establishment of culture collections and related services, to provide liaison and set up an information network between the collections and their users, to organise workshops and conferences, publications and newsletters and work to ensure the long term perpetuation of important collections.

The Federation works through a series of committees (education; publicity; postal, quarantine and safety; patents; standards for collections; endangered collections). It produces publications and documents ('Living Resources for Biotechnology' series, Cambridge University Press, 1988, 1991; 'Maintenance of Microorganisms and cultured cells', Academic Press, 1991; Standards for Culture Collections, December, 1990, CABI; Newsletters and Technical Information Sheets). It arranges a Congress every four years (the next will be in Beijing, October 12th-16th, 1992, on 'Biodiversity: the role of culture collections'). It is the international body concerned with the promotion of collaborative programmes between culture collections and other relevant organisations. It provides liaison with other sectors of ICSU.

One of the major roles of culture collections is data collection and dissemination. The supply of microorganisms without the associated information accumulated through work on cultures by depositors, research scientists and the collections themselves, is a diminished service. Recipients of such biological material would be obliged to commit time and effort to regaining information that may already exist.

Most collections now have a strong bioinformatics element to support their curatorial activities. Computers are used for the following:

* lists and catalogues of holdings
* physiological, biochemical, morphological, genetical, historical data on strains
* bibliographic references to strains
* methods, protocols
* collection procedures (preservation calendars etc)
* numerical taxonomic studies
* general statistical needs
* identification programmes
* exchange of data with colleagues, comparing strains
* searching other databases for own or collection users' needs
* word processing
* customer control (purchases, customer addresses etc)
* spread sheets for collection budgeting, forecasting
* communications with other collections and the wider scientific community.

Many collections are collaborating in the development of regional data resources. Examples of these are the developments in Latin America, led by the Tropical Data Base initiatives in Campinas, in India through the Distributed Information Centre in Pune, in the USA through the Germplasm Data Network. In Europe, the Commission of the European Community has supported a number of bioinformatics initiatives such as the Information Centre for European Culture Collections (ICECC), the Microbial Information Network Europe (MINE, developing an integrated database of primary strain data) as well as the Microbial Strain Data Network.

It often happens that the creation of a network leads to the development of databases; sometimes the development of an international database leads to the creation of a network. In the case of the WFCC, both have happened.

The WFCC (through the activities of Professor Skerman, University of Queensland, Australia, and his colleagues in the 1960's) pioneered the development of an international database on culture resources worldwide. The result is the World Data Center for Collections of Microorganisms (WDC). This data resource is now maintained at RIKEN, Japan and has records of nearly 400 culture collections from 55 countries. The records contain data on the organisation, management, services and scientific interests of the collections. Each of these records is linked to a second record containing the list of species held. The WDC database forms an important information resource for all microbiological activity and also acts as a focus for data activities among WFCC members. It has led to a network.

Many WFCC members also use the Microbial Strain Data Network (MSDN) as a communications mechanism for e-mail. The ability to make easy contact and exchange information with other Federation members has made an important impact on collection developments, particularly in the developing nations where conventional communication systems are difficult or expensive. Culture collections feel far less isolated when electronically linked and as a consequence scientific standards and activity are advanced. Furthermore, the existence of the MSDN network has encouraged the use of this distribution mechanism for making databases available internationally. The MSDN and the Tropical Data Base (BDT) staff collaborate with curators in formatting and loading databases. A network has stimulated the development of databases.

The MSDN is sponsored by the International Union of Microbiological Societies (IUMS), the Committee for Data in Science and Technology (CODATA) and the Committee for Biotechnology (COBIOTECH) as well as the WFCC. As many of the officers of these organisations use the network for communications' purposes, it affords easy access to the international scientific organisations of significance to culture collections. Easy contact with these and other organisations using the MSDN for communications has similarly facilitated international collaboration of WFCC members in global programmes.

It is clear that computers and networking in particular have had a major effect on culture collections. They have encouraged international information exchange; they have led to the development of new and important databases for the scientific community; this in turn has supported research; in some cases joint commercial ventures have resulted from communications across the academic/industrial divide. Computing and communications technology have enabled the collections to develop up-to-date services and provide excellent support for research. The needs of biodiversity will require that these developments continue and expand as the country studies, inventories and major multinational research programmes get underway.

The WFCC shares the experience of many other groups in finding that ease of communication is a very great benefit to those scientists able to network; the danger now is that those unable to network are left more isolated than before. It is important that programme designers and funding

agencies recognise this emerging problem and take steps to ensure that important groups are not left out of international programmes for this reason alone. Networks must be accessible to all, and technological developments and training must progress in parallel to ensure equal opportunities.

It is appropriate that the WFCC should be one of the organisations that proposed this workshop. Its members are certain to take considerable interest in the recommendations and seek to implement networking technologies of the future for their own scientific advancement. The culture collections are a major part of the infrastructure of biodiversity; they have skills to offer in culture preservation, taxonomic studies, identification and database development. They will become increasingly important as resource and taxonomic centres, conserving microbial germplasm for the future. In this, their networking experience will be exploited to the full.

CHAPTER 5

PAPERS CONTRIBUTED BY ONLINE PARTICIPANTS

The papers in this Section were contributed online during the workshop, or immediately afterwards.

5.1 AARNet

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AARNet is a physical network linking together Australian academic and research institutions (and some commercial organisations) by providing the platform for data communication through the use of multiple protocols.

Protocols are so important in determining the nature of the network that a network is often described by its protocol type. The most common protocol used on AARNet is called TCP/IP (for Transmission Control Protocol / Internet Protocol) and is implemented on all AARNet nodes. AARNet is therefore a TCP/IP network, or simply, an IP (Internet Protocol) network.

Through a link from Melbourne to California, AARNet becomes part of The Internet, a worldwide network originating in the US. The Internet connects many separate IP networks and computers using the TCP/IP protocols. These include North American educational, military, government, and research networks as well as numerous other national networks similar to AARNet. Many commercial and industrial organisations are also connected although usually only for electronic mail functions. Thus computers on AARNet are linked to some 100000 other machines and millions of users throughout the world. Using AARNet as an IP Network is therefore the same as using Internet.

How AARNet is Organised

AARNet was established in 1990 at the initiative of the Australian Vice-Chancellors Committee (AVCC). Its brief was to provide a computer based communication service to Australian academics and researchers to enable the dissemination of information and knowledge, encourage dialogue, debate, and the interchange of ideas, and to foster intellectual and cultural sharing, cooperation, and understanding.

AARNet is administered for the AVCC by a special section of the AVCC secretariat working in conjunction with the computing services departments of constituent institutions. It is this section which is responsible for maintaining the connections between sites, ensuring standards and consistency, providing support and controlling functional matters such as name and address allocation.

Access

Because AARNet is funded by the AVCC and subscriptions from member institutions, no individual charges are made. Each AVCC member institution can access the network as often as required and it is then up to each organisation to decide which network services to provide and who can use these services. Non-educational institutions can apply for affiliate membership of AARNet and organisations (including commercial ones) with no direct links to AARNet can arrange to be connected to AARNet sites in order to receive e-mail and News feeds.

In addition to the AVCC member contributions, and affiliate membership fees, AARNet receives a contribution from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) that allows the various CSIRO research divisions to connect to the network, and the Australian Research Council has provided seed funding for the first three years of AARNet's operation.

Architecture

AARNet comprises a two-tier star-like layout. A national hub, located at Melbourne University connects via leased data communication lines operating at speeds of between 48Kbps and 2MBps to six regional hubs located at large universities. Each regional hub is connected via owned or leased lines to each of the participating organisations within that region, typically at 48Kbps but at speeds up to 10Mbps.

AARNet is connected to the rest of the Internet via a 512Kbps satellite link from the national hub to California.

AARNet provides the medium (the lines) for carrying the data and the dedicated communication hardware (specialised computers) for routing data to the correct destination.

Each institution has the responsibility to provide and maintain the software on its own computers which implements the protocols for data communication on AARNet and which facilitates use of the services available over AARNet--for example e-mail systems.

As well, each institution maintains its own local networks and it is the responsibility of the institution, if they so wish, to connect these local networks to the AARNet link. In this manner local networks or subnets can become part of AARNet and Internet.

Additional information about AARNet is available via anonymous FTP from aarnet.edu.au in directories :

pub/doc	general information,affiliate membership papers, member list
pub/reports	AARNet quarterly reports
pub/user-guide	AARNet user guide
pub/resource-guide	AARNet Resource Guide

5.2 AUSTRALIAN BOTANICAL BIODIVERSITY NETWORKS
Human (mostly) and electronic (starting) - a national perspective

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BACKGROUND

Although geographically a large country, Australia is divided into only seven major political units (States and Territories). Each of these has its own government and public service, part(s) of which have responsibility for biodiversity documentation, conservation and management. In each state ort territory, there are government herbaria, ranging in size from 100,000 to 1,000,000 specimens. The states are united at a national level by the Commonwealth government; two separate agencies of the national government maintain herbaria with collections each in excess of 200,000 specimens). In addition to the major state and national herbaria, there are c. 20 smaller regional, teaching or specialist herbaria associated with universities, and other public operations. Most of these smaller herbaria are staffed to a very low level but a couple of their collections exceed 100,000 specimens. (For details see the Australian entries in the 1990 edition of Index Herbariorum).

With such a small number of herbaria with relatively well defined areas of geographic interest, it has been possible to establish and maintain a national environment of collaboration and cooperation in the activities of the state herbaria, assisted by several national government programs. The result is an administratively functional network of Australian herbaria, coordinating programs of botanical activity, research, information exchange and specimen management. This level of interaction would be much more difficult to achieve if the number of States was higher and each State lacked a focal government supported herbarium.

The following describes some of the major organizations, agencies and programs involved in research and documentation of botanical diversity and how they interact and are coordinated at a national level. It has been written from the point of view of herbarium collections and research and does not cover vast amounts of activity taking place in the areas of plant conservation, landscape and habitat research and management, and ecology, nor the botanical research activities of the universities.

CHAH

The Council of Heads of Australian Herbaria (CHAH) is made up of the heads of each of the seven State herbaria and two national herbaria (Herb. AD, BRI, CANB, CBG, DNA, HO, MEL, NSW, PERTH). It meets formally once a year in a different State capital city to discuss issues of mutual concern, to advise of and coordinate programs and to consider and plan initiatives to further systematic and taxonomic botany in Australia; the chair of CHAH rotates according to the State in which the meeting is held. A representative of the major new Zealand herbaria (Her. AK, CHR, NZFRI, WELT) and from the Papua New Guinea National Herbarium (Herb. LAE) attend each meeting as observers. A modest annual subscription from members enables CHAH to support small but significant botanical projects. CHAH has produced a publication 'Current Plant Taxonomic Research on the Australian Flora', listing organizations and individuals involved in this activity; it is currently being updated and will be maintained as a database and hopefully be made available

on the network. CHAH has no permanent base and secretariat - contact individual herbaria. Current Chair: Neville Marchant (herb. Perth) fax +61-9-3670515.

Contacts:			
	AD	John Jessop	fax +61-8-2231809
	BRI	Gordon Guymer	fax +61-7-3716655
	CANB	Judy West	fax +61-6-2465249
	CBG	Jim Croft (jrc@anbg.gov.au)	fax +61-6-2509599
	DNA	Clyde Dunlop	fax +61-89-323849
	HO	Gintaras Kantvilas	fax +61-02-207865
	MEL	Jim Ross	fax +61-3-6552350
	NSW	Barbara Briggs	fax +61-2-2514403
	PERTH	Neville Marchant	fax +61-9-3670515

(There are similar organizations covering other biological collections:
CHABG Council of Heads of Australian Botanic Gardens
CAMD Council of Australian Museum Directors
CHAEC Council of Heads of Australian Entomological collections)

ANPWS and DASET

At the national level, government activity in biodiversity is handled largely in the portfolio of the Minister for the Environment. The Department of Arts, Sport, the Environment and Territories (DASET) has the responsibility for coordinating input from State and national bodies to synthesize government environmental and biodiversity policy. The Australian government recently held an enquiry into biodiversity and has produced a draft biodiversity strategy for public comment. Agencies within the portfolio, such as the Australian National Parks and Wildlife Service (ANPWS) have the responsibility for implementing and delivering the national government's environmental and biodiversity programs.

The ANPWS has several national programs that make up a large part of the network of biodiversity activity in Australia. It is responsible for the Australian National Botanic Gardens and its herbarium (Herb. CBG), the Australian Biological Resources Study (ABRS), the Environmental Resources Information Network (ERIN) and the Endangered Species Program (ESP). It is also responsible for the management of a network of reserves, national parks and conservation areas, and a range of wildlife management activities, and for the administration of range of international treaties and conventions (such as the Trade in Endangered Species - CITES). Contact: David Kay (ANPWS Executive Director, Biodiversity davidk@anbg.gov.au) fax +61-6-2509599p; Wanye Slater (Director ERIN wayne@erin.gov.au) fax +61-6-2500360. Some of these programs are described below.

ABRS

The Australian Biological Resources Study (ABRS) is a national government program whose role is to stimulate and guide studies in Australia's floral and faunal diversity. It does this through support to the systematic biological community in Australia through a grant scheme for research and scientific writing and the production of scientific books and databases on the systematics, taxonomy and distribution of the Australian biota. ABRS also supports the Australian Botanical Liaison Officer (ABLO) based in Kew, a position which forms a major connection the international network of herbaria; in addition to taxonomic research, a major function of the ABLO is to provide Australian botanists with information on specimens, literature, etc. that is not readily available in Australia (the current ABLO is Peter Weston: fax +44-81-3325278 - the ABLO is not presently on internet but the possibility of connection is being investigated). Contact: Helen Hewson (flora)

or Jean Just (fauna) fax +61-6-2509448 - ABRS staff will be connected to the internet in the next few months.

ERIN

The Environmental Resources Information Network (ERIN) is a national government program whose role is to provide geographically related environmental information for the purposes of planning and decision making. It is creating and populating databases of environmental information and coordinating efforts to collect this data on a national scale. ERIN coordinates and provides grants to capture herbarium label data of strategically important plant families; this particular activity is possible because Australian herbaria saw the need to create and adopt herbarium accession data standards (HISPID) and had been modifying their systems to conform to these standards. Contact Wanye Slater (Director wayne@erin.gov.au) or Arthur Chapman (Biogeographic Information arthur@erin.gov.au) fax +61-6-2500360. (A more detailed account the role and activities of ERIN is available on the biodiv-l listserver).

ESU

The Endangered Species Unit (ESU) is responsible for the commonwealth Endangered Species Program (ESP) which aims to prevent the extinction of native species, prevent species from becoming endangered and to return endangered species to a secure status in the wild. The program provides grants for work at the habitat and taxon level and has provided resources to create and maintain the national list of rare or threatened Australian plants (ROTAP) and to enable the capture of herbarium specimen label (and other) data of these taxa; a large part of this work was done by the CSIRO (Herb. CANB). A large component of the ESP covers the development and implementation of recovery plans for threatened or endangered taxa. ESU supports and encourages the National Threatened Species Network, a network of community and government organizations promoting the conservation of threatened species. In Australia, the legislative responsibility to nominate and manage protected flora in invested in the States; ESU assists the States in their efforts to achieve consistency in the definition of protected and rare flora. Contact: John Hicks fax +61-6-2500214 - within weeks ESU staff will be connected to the internet. (A more detailed account the role and activities of ESU will be available on thebiodiv-l listserver).

ANPC

The Australian Network for Plant Conservation (ANPC) was established to form a nationally coordinated multisite collection of rare and endangered Australian plants, to coordinate and provide information on the integrated management of this plant resource and to nationally promote plant conservation. The ANPC organizes workshops on plant conservation topics and produces a regular newsletter. It is funded from grants from the Endangered Species Program and from membership subscriptions. The secretariat for the ANPC is based at the Australian Nation Botanic Gardens. Contact: Mark Richardson (mark@anbg.gov.au) fax +61-6-2509599. (A more detailed account the role and activities of ANPC is available on the biodiv-l listserver).

CSIRO

The Commonwealth Scientific and Industrial and Research Organization (CSIRO) maintains a herbarium (Herb. CANB) within its division of Plant Industry as support for past and present botanical and floristic research and survey programs. It has been heavily involved in the research and documentation of Rare or Threatened Australian Plants (ROTAP), gathering information from State and other agencies. Plans are being considered to consolidate this herbarium and that of the

Australian National Botanic Gardens (Herb. CBG) in a jointly resourced and run botanical research centre. Contact: Judy West fax +61-6-2465249.

HERBARIUM DATABASE APPLICATIONS

All Australian State and national herbaria have embarked on a program of a computerized database or catalogue of their collections. Support for this activity has come from institutional program funds and grants from ABRS, ERIN and ESU. Three collections are completely computerized (Herb. BRI, DNA, QRS) and the remainder range from 5%-50% entered. The computing platforms range from single-user personal computers to shared departmental mini computers. Database software has settled on two main platforms: Oracle (5 sites) and Titan (5 sites) with a variety of database designs ranging from flat file to relational. The almost total lack of uniformity of database design caused considerable concern in the early days of database implementation in Australian herbaria but the recent focus of standardization at the interchange level (HISPID) rather than the institutional database level has enabled a remarkable convergence in the definitions of data managed by the herbaria.

At the moment none of these databases are made available on-line and requests for information must be passed to the heads of the herbaria concerned. Herbaria do not hold copies of each other's specimen data but subsets have been exchanged for particular research projects. Of particular interest here is the ERIN land-cover project where specimen records of strategic taxa (grasses, eucalypts, chenopods, rare taxa, etc.) were combined at ERIN for various plotting and prediction projects. Issues of data custodianship, and the availability or raw data and derived information are under continual discussion with and between herbaria. Unfortunately only a few of the major herbaria have access to email at the moment but all are attempting to obtain access to this facility over the next 12 months.

Contacts:			
	AD	Bill Barker	fax +61-8-2231809
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	CANB	Judy West	fax +61-6-2465249
	CBG	Jim Croft (jrc@anbg.gov.au)	fax +61-6-2509599
	DNA	Clyde Dunlop	fax +61-89-323849
	HO	Gintaras Kantvilas	fax +61-02-207865
	MEL	Don Foreman	fax +61-3-6552350
	NSW	Barry Conn / David Bedford	fax +61-2-2514403
	PERTH	Alex Chapman	fax +61-9-3670515

HISPID

Over the past four years, Australian herbaria, supported by the national government programs mentioned above, have been making concerted efforts to create a database and data exchange environment that facilitates the movement of herbarium accession and related data for research and management purposes, between institutions as a more or less automated and seamless process. A result of this has been the production and refinement of HISPID, Herbarium Interchange Standards and Protocols for the Interchange of Data, a set of conventions and standards that the major herbaria have agreed to implement and use in their herbarium data processing systems. A regular series of workshops continually refines HISPID as agencies identify problems in its implementation and devise enhancements or extensions.

At the moment HISPID is a series of field or attribute definitions with various data definition, cataloguing and encoding rules. It exists as a word processor document (c. 60 pages) with c. 110 field definitions covering record and specimen management and storage, identification, taxonomy

and typification, collection details, locality and habitat, plant description and attributes, loan and exchange details. It is intended to define the data exchange environment rather than database design; however herbaria are adopting it in their database design to minimize programming required for the import and export of data. The exchange format that has been adopted is a tagged field format based on the OSI compliant ISO standard ASN.1 (ISO/EEC 8825 and 8824).

The current (soon to be updated) version of HISPID is available from the TAXACOM ftp server at Harvard (contact Jim Beach beach@huh.harvard.edu) both as an ASCII text file and a Postscript file. The uniform structure of the HISPID definitions allows them to be stored in a database as a data dictionary; as an experiment, HISPID has also been entered into the data dictionary of a commercial database CASE product (Oracle CASE) defining it as a relational database application. Contact: Jim Croft (jrc@anbg.gov.au) fax +61-6-2509599. (A more detailed account the development of HISPID will be available on the biodiv-l listserver)

CAVP / APNI

In addition to datasets based on herbarium specimen acquisitions, Australian herbaria maintain records of taxonomic and regional census information and specialized databases of information on rare and endangered plants, etc. Commonwealth government agencies coordinate elements of this information at a national level. For example, herb. CBG is the current custodian for the Australian Plant Name Index (APNI, c.60,000 records) and the Census of Australian Vascular Plants (CAVP, c. 20,000 records), assembled from contributions from each of the States and maintains this dataset based on input from the State herbaria and other agencies. This data is being restructured and is not available on the network yet but it is planned to make it (or portions of it) available by anaonymous ftp or by email server in the future. Contact: Jim Croft (jrc@anbg.gov.au) fax +61-6-2509599.

TDWG & IOPI

Australian herbaria have agreed as far as possible to follow existing international standards for data storage and exchange specifications relevant to botanical and herbarium accession information. Thus the standards recommended and developed by TDWG have been adopted by Australian herbaria in the first instance and modified where necessary to suit the Australian situation. The HISPID protocols adopted by Australian herbaria are based on TDWG standards. Staff of Australian herbaria and other botanical agencies participate in and contribute to the activities of TDWG. The present Australasian regional representative for TDWG is Barry Conn (fax +61-2-2514403).

Australian herbaria and botanical agencies are also actively involved in the International Organization for Plant information (IOPI) and its various working groups. As the IOPI project progresses, these agencies will be providing data and information from various published floras, revisions and checklists. For example, the Australian Plant Name Index and the Census of Australian Plants will be made available to the IOPI checklist project as digital data. The present secretary of IOPI is Alex George based in the Bureau of Flora of ABRS: fax +61-6-2509448. (More detailed accounts the roles and activities of TDWG and IOPI are available on the biodiv-l listserver)

AARNet

The Australian Academic Research Network (AARNet) is the internet backbone linking the universities and other tertiary educational institutions, the CSIRO and some government departments and private organizations. ERIN, herb. CBG, CANB and QRS are connected to AARNet and other state herbaria are planning to connect in the near future; email type

communication between herbaria is planned in the first instance, but ftp, telnet and other facilities are likely to follow. Contact: Peter Elford (p.elford@aarnet.edu.au) (A more detailed account the role and activities of AARNet is available on the biodiv-l listserver)

ASBS

The Australian Systematic Botany Society (ASBS) is a society of professional and amateur botanists interested in the taxonomy and systematics of Australian plants. The society has c. 350 financial members, with regional chapters in each state which hold regular meetings. The society is supported by staff of all the state and national herbaria and staff and students of the universities and organizes annual national symposia on plant systematic or biogeographic themes. ASBS has an international membership of c. 30 and produces a regular quarterly newsletter. President: Mike Crisp (mike.crisp@anu.edu.au)

The Future

The success and vitality of biological diversity networks in Australia (and globally) will follow the ability of individuals and the staff of relevant agencies to join the electronic community and the willingness and commitment of agencies to make the data for which they have custodial responsibility freely available on the network. The issues of custodianship and the management of concurrent data sets are complex and need active and efficient human and electronic communication networks. At present, all of the Australian Universities have internet access through AARNet but few of the major herbaria have connection. ERIN uses AARNet as part of its communications strategy; the ESU will be connected (through ERIN) in a few weeks and ABRS will be connected in a few months. The Australian herbaria will be trying to make connection over the next year. Individuals and smaller herbaria may not be able to justify the equipment and connection charges to AARNet, but private and commercial solutions such as Pegasus would be able to provide services at rates comparable to those of facsimile facilities.

For the next year or two, electronic communication and data exchange is likely to be restricted to electronic mail and services related to this. The Australian botanical community does not have the resources to embrace high technology in a big and universal way but data and files on demand through email list servers are within the grasp of most institutions. The more dynamic facilities of anonymous ftp, telnet, remote logins etc. are beyond the financial grasp of most State herbaria and the shared vision of an Australian distributed botanical database is quite a way off. In the absence of a distributed database, institutions are reluctant to divert scarce resources from their existing curatorial and research programs to maintaining a duplicate set of combined data. Distributed database technology is only just becoming within the grasp of herbaria and it is an exciting concept for all herbaria to be able to have transparent access to each others data with each institution maintaining the datasets for which it is responsible. Over the next year, ERIN and the herbarium of the Australian National Botanic Gardens (herb. CBG) will be experimenting with distributed databases based on the Australian Plant Name Index (APNI) as a model for a more extensive distributed database involving more herbaria. Both ERIN and Herb. CBG plan to make selected document and data files available by anonymous ftp and to install email listservers over the next year.

5.3 GLOBAL NETWORKS AND INTERNATIONAL COMMUNICATIONS: AFRINET

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[Workshop participants discussed the problem of how to reach the 3rd world, using e-mail. For this reason we are mailing information on AFRINET (contributed by John McComb, WCMC)]

I. Introduction:

The relationship between information processing and communication on the one hand and modern economic and social development on the other is widely recognized among the African countries. The efficient and effective exchange of information among researchers, educators, administrators, industrialists and policy makers is crucial for the conversion of research results into useful products of economic and social value.

At the research level, interaction and communication with peers and potential users of research results are necessary for the stimulation, self-confidence, relevance and effectiveness of a scientist. Modern scientific research relies heavily on the ability to communicate; gather reliable data; have access to widely dispersed data and information (including analysis); collaborate on projects; hold discussions, meetings, seminars, and conferences; and repackage and disseminate the results. The pace and complexity of modern research have greatly increased the communication needs of researchers, scientists, educators and their institutions. A scientist isolated is a scientist unable to articulate his purpose and needs; such a scientist soon becomes obsolescent. The provision of appropriate information systems and services for this group of information generators therefore becomes apparent.

The dissemination of information to other user groups has to be designed and implemented carefully (IDRC,1989 [ww.p 16]). Sometimes the information has to be repackaged or consolidated before delivery to specific target audiences. For example, published results of scientific and technological research on agriculture, health, the environment, economics etc., must be repackaged to be understood by administrators, policy makers, extension workers and other intermediaries, as well as by the final users such as farmers and the community at large. This calls for innovative and appropriate methods, media and techniques, such as print and non-print forms, audio-visual, or even oral according to the prevailing conditions and/or traditions.

The phenomenal improvements in information processing and communication capability brought about by rapid, convergent developments in computer and telecommunication technologies are also well recognized in Africa. This enhanced awareness of potential opportunities is indicated by visible efforts in many African countries to create and sustain the enabling institutional and human

environment for utilizing these new capabilities. A recent study group (BOSTID,1990) was "impressed to find virtually all the modern information technologies already in use in some African institutions." These technologies encompass: desktop publishing; CD-ROM and other databases; electronic mail and computer conferencing; as well as telefax. The population of microcomputers was significant and growing rapidly (In Kenya we estimate that from about 200 computers in 1980, there are now at least 2,000, and probably closer to 10,000 units in 1990 in educational, business, NGO and governmental environments). And there are tens of world-class projects and systems, especially in international business (banks, airlines etc.), institutions based on the continent; as well as exciting instances of rural and grass- roots projects (e.g. Aga Khan Computers in Kenyan Schools project; UNESCO rural journalism project in Kenya; Prof. P.N. Nkwi's project in rural Cameroon etc).

II. The Afrinet Project:

This paper describes the development of a collaborative technology project combining computer conferencing, videotext (VTX), electronic mail, and computer phone to create a distributed educational, scientific, and social development research network that networks a number of African universities and scientific research organizations with each other and with international academic and scientific institutions. In addition to the academic conferences we will network a number of international scientists together into a series of conferences dealing with issues ranging from biotechnology, food systems, cooperative development, business and public administration management, biomedical research to the social sciences and humanities. Although these conferences will supplement many of the courses we offer online, they will be independent of them and promote collaborative and conjoint research efforts among the international participants. Using VTX videotext we will establish a number of scientific data bases of African research materials that will be distributed among several African nodes, as well as develop others on international nodes that pertain to African scientific research and academic interests. We will also network social and community development groups online, and organize both academic and commercial uses of the network. In this manner we will build a sustainable network combining academic, social development and commercial interests and support.

We are designing a distributed international DECNET VAX Mail, VAXNotes computer conferencing and VTX videotext network which will interconnect host computers in several African universities and research institutions with a number of universities in the United States, Mexico, Argentina and Ireland that are currently part of the BESTNET VAX based academic computer communications network. The conferencing software will be used to establish on-line or virtual scientific research laboratories and to conduct seminars, distance education courses and social development projects. VTX Videotext will be used to establish scientific research and library data bases stored as separate pages on each of the separate nodes. In addition, we will develop a front end containing gateways from the BESTNET network into the NSF supercomputer backbone to provide African scientists and researchers access to those facilities. We will encapsulate DEC-NET for transmission over the TCP/IP Internet, and establish a wide area network between the VAX computers so all can be accessed from any of the nodes.

This project stems from a series of meetings sponsored by Digital Equipment Corporation for the global extension of BESTNET into Africa. These meetings involved representatives from the National Science Foundation (NSFNET division), National Academy of Sciences, American Association for the Advancement of Science, the World Bank, Agricultural Cooperatives Development International, USAID, the African Development Foundation and the California State University system. These representatives met with representatives from several organizations internal to Digital who are in support of this effort. As a result of those meetings it was decided that the African Academy of Sciences was the appropriate African organization with which to work,

and that the California State University and BESTNET should co-develop proposals with them to Digital, NSF and other sources of funding to establish an African computer communications network and integrate it with the already functioning and Digital supported BESTNET project.

III. A Profile of the African Academy of Sciences

The African Academy of Sciences is a continent-wide, non-governmental, non-political and non-profit organization of senior scientists, science policy experts and science managers with its secretariat in Nairobi, Kenya. Started in 1985, it is dedicated to the promotion of science and technology for development. It does this through a vigorous program of activities spanning mobilization and strengthening of the African scientific community; networking; publication and dissemination of scientific materials; policy research; and capacity building in science and technology.

The Academy operates as a multi-level network of individuals and institutions. As an honorific society, its membership of Fellows who are elected annually on criteria of excellence and contribution to African science has reached 86 persons in 25 countries. Its Network of Scientific Organizations (NASO), within which the AFRINET project is to be situated, is another formal mechanism for the generation and exchange of ideas which will immediately benefit from computer-based networking. It has already attracted 118 members from 30 countries.

Many of the Academy's projects are designed to serve and involve scientists, industrialist and policy makers and society in general beyond the formal membership of the Academy. Its Profiles and Databank of African Scientists and Scientific Institutions is open to all and already covers thousands of scientists in over 40 countries. Whydah, the Academy's quarterly newsletter is mailed to 4,000 people all over the world; and Discovery and Innovation, the Academy's multi-disciplinary, peer- reviewed quarterly journal has touched the lives of thousands of scientists in hundreds of institutions the world over as authors, reviewers, subscribers and readers.

The Academy's think-tank called the Special Commission on Africa, which meets regularly to deliberate on Africa's problems and make recommendations, is already an authoritative developer of informed discourse on Africa' future as well as on the interaction between research, development and public policy. The Academy has recently entered the area of research funding through two projects on Capacity Building in Forestry Research (CBFR), and Capacity Building in Soil and Water Management (SWM). Through these projects, the Academy is developing a deep and extensive knowledge of Africa's scientific resources and how they may be enhanced in order to contribute more effectively to the continent's science-driven development. It also organizes conferences, meetings and symposia, publishes monographs, proceedings and reports as well as encouraging other regional organizations through specific assistance programs. It has therefore established itself as a major pan-African forum for scientific and intellectual discourse and communication, as well as the key place in efforts to bridge the gap between scientists, industrialists and policy makers in the drive towards Africa's social development. AAS collaborates with other African and international organizations in implementing specific programs, which in turn are generously supported by many donor institutions, both public and private.

The Academy enjoys great geopolitical support from Africa's leaders, many of whom already actively participate in Academy programs (e.g. the Management of Science Project chaired by Gengovernments. Once this is accepted and subscribed to, the AAS's formal recognition as an international organization with diplomatic status will be complete. This diplomatic exercise is at an advanced stage, more so with the host country, Kenya. This already eases the operational transactions of the Academy involving the movement of its officers, staff and collaborators, funds and duty-free acquisition of equipment and supplies. The Academy has set up a high caliber

secretariat of international professionals and support staff backed by modern managerial and information processing and communications systems of world standard. Most of the operations are computerized, including desktop publishing with acceptance of computer readable materials. It is therefore clear that the Academy itself would be a large user of computer networking.

IV. A Profile of BESTNET

The Bestnet project involves hundreds of students each year from over a dozen institutions in the United States and Mexico. Recently, we extended the network to include students and colleagues in Argentina and Canada, and now will soon be involving universities in Kenya and Zimbabwe. We accomplished this by establishing a distributed computer conferencing and videotext network over NSF-NET, which interconnects host computers at university campuses. We utilize VAXNotes conferencing software for on-line courses, seminars and faculty research discussions and VTX videotext for library data bases and other course materials that are stored on each of the separate nodes. The Digital Equipment Corporation is co-sponsoring this project with external research grants and is providing several MicroVax computers containing the Digital educational library of software, VAX Notes conferencing and VTX videotext to universities in the United States, Latin America and Africa. We encapsulate DEC-NET for transmission over the TCP/IP Internet, and establish a wide area network between the VAX computers so all can be accessed from any of the nodes.

Faculty at each institution teach on-line university credit courses in biological, natural and social sciences at their local nodes. These course conferences are open for students enroled at all institutions. In this manner students interact with each other and other participating faculty across the institutions as a regular part of each class. They do so by signing on to their local university VAX computers that are connected to NSF- NET/Internet. The lists of conferences that appear their computer screens are being distributed among the campus nodes. However, students enter any given conference from their local node and DECNET interconnects to the distant node where it is housed. Thus, from the users point of view the distributed network will appear seamless.

In addition to the conferences faculty put scientific data bases on the VAXes and make them available to other participating faculty and their students. These data bases are accessed using distributed VTX videotext. When students and faculty log onto their local host they encounter a videotext front end that gives them a choice between using computer conferencing, videotext data bases, electronic mail or computer phone (for synchronous interaction). The front end is now being designed to make it tailorable to the social, cultural and language factors that characterize different types of user groups involved in the BESTNET project.

In addition to the collaboration of VAXnotes conferencing and VTX videotext our distributed network also includes electronic mail and a computer phone or chat utility. Mail is used for private communications with faculty, teaching assistants and other students, and phone for on- line synchronous office hours and technical assistance. BESTNET represents the first use of a fully distributed computer communications network, which is encapsulated as a independent system over the NSF- NET/Internet. The ease of functionality in our distributed conferencing, videotext, mail and computer phone will greatly facilitate the use of NSF-NET for both on campus lab based and off campus distant education programs.

VI. The Viability of Computer Communications for Distance Education and Scientific Collaboration:

The following are some of what we have learned in the course of the project. These findings were based on research conducted by faculty using a combination of user interviews and content analyses

of conferences for various types of courses and collaborative research projects. These findings are summarized as follows:

1. The technology greatly augments regular classroom instruction as well as is a viable technology for off campus or distant education.

2. Computer conferencing is a viable interactive component to video or instructional television courses by providing individualized attention to student needs and requirements that can not be obtained using traditional methods of audio and video feedback.

3. Computer conferencing supports a socratic method of instruction, whereby students are much more actively involved in the learning process rather than being passive recipients.

4. Computer conferencing and supportive technologies (EMAIL and computer phone) promotes participation and learning in traditionally communicative apprehensive learners.

5. The technology greatly augments student interaction and promotes attitudes that such learning is more legitimate as part of the pedagogical process. In traditional classroom situations students are often reluctant to interact with others except the instructors, whereas computer communications promotes student to student interaction.

6. The anonymity of the technology promotes discussion that otherwise would be inhibited out of concern for student negative face-to-face feedback.

7. The technology is particularly useful for facilitating group discussion and criticism in virtually all areas of the curriculum.

8. The technology facilitates writing across the curriculum, and greatly improves student writing, editorial and logical skills.

9. The technology is particularly viable for reaching linguistically and culturally diverse learners, and has been positively accessed in student evaluations.

10. When the technology is used along side video presentations of lectures that students move faster than the televised segments. Where at first we used computer communications to augment and supplement video instruction, we now use video to supplement computer communications delivered instruction.

11. Students are able to master the basics of VAXNotes in a single lab session if they are required to immediately begin doing online assignments. However, user-consultant assistance is required for troubleshooting during the first two weeks of instruction. The basics include: accessing server, entering username and password, opening notes, reading topics and replies, writing a topic and writing a reply, leaving notes and logging off the system.

12. Computer naive students learned with equal facility as those more sophisticated with the technology.

13. Social science and humanities students having some word processing skills learned and accepted the technology at an equivalent level with students taking computer science courses (e.g., our Pascal, C and data structures courses).

14. Topics and reply branches are particularly viable for online terminal mode interaction.

15. Some online terminal mode activity is important for developing attitudes of connectivity with their diversified electronic groups - both for computer phone online office hours and for asychronous terminal mode writing in conferences.

16. The computer phone utility facilitates the development of asychronous conferencing skills.

17. The computer phone utility is useful for online user consultant assistance.

18. Students particularly adapt to the technology when interacting with students from distant locations and campuses.

19. We learned how to use group reading of conference notes in a class to promote discussion with students on distant campuses and international locations.

20. Thinking textual is sufficient to improve literacy even when a liberal attitude is taken toward grammar, syntax and spelling.

21. Writing skills improve with active participation in computer conferences.

22. The anonymity of the medium is sufficient to promote critical discussion, and is as effective as anonymity of identity in conferences.

23. The connectivity of the medium promotes friendly attitudes towards those engaged in discussion.

24. The medium promotes more critical than hostile competitive discussion.

25. VAXnotes promotes stronger group attitudes and participation than Email distribution list organized conferences.

26. The Internet can be used to establish an international distributed VAXnotes network.

27. The distributed network is crucial for multiple campus participation, technology transfer and local capacity building.

28. The technology promotes collaborative research among faculty by expanding networks of scholars.

30. Because conferences are logged by time and date of entry there are intellectual property rights recognitions built into the mode of communication.

VII. Networking the AAS and BESTNET

At the present times there are no Internet nodes in sub- Saharan Africa. We are developing a cooperative National Science Foundation proposal between US universities with the African Academy of Sciences to that end. However, to immediately implement the project we are initially developing the network by encapsulating DECNET for X.25 networks currently operating in Africa. These public data networks will permit the networking of computers in the selected African countries - Kenya and Zimbabwe, which will then transmit to the California State University systemwide computer communications network - CSUNET. This network is the largest internal academic regional network. It is based on the CCITT X.25, and encapsulates other major protocols, including TCP/IP, SNA/SDLS, DECNET, AppleTalk, Bisync and X.3 Pad. This will allow the

CSUNET to de-encapsulate DECNET from X.25 once received and then re-encapsulate into TCP/IP for interconnection into the distributed BESTNET network with gateways into NSFNET and the Supercomputer Center Network.

In this manner we will immediately be able to interconnect VAX computers at the University of Zimbabwe in Harare with those at the African Academy of Sciences in conjunction with the University of Kenya in Nairobi. We also propose to provide smaller MicroVAX computers to university and related scientific laboratories in other neighbouring countries where local telephone capabilities and national policies allow. This will permit much needed computer communications interactions between African scientists in pest research, marine biology and fisheries research, biomedical sciences, natural products development, agronomy, community development and science/social science policy.

Using the international X.25 connection into CSUNET these scientists also interact with colleagues in the United States, Latin America and Europe who are involved in the BESTNET network, and have a direct gateway into international scientific and library data bases, and be provided access and accounts at the San Diego Supercomputer Center.

Concomitantly, international scholars will have access to African researchers and their respective databases stored as distributed pages of VTX videotext on the African based VAX computers. In this manner, we will promote computer communications supported collaborative work and research between African scientists, and with international scholars outside of the continent.

In addition, students and faculty from the African universities in will interact with students and faculty in the United States and Latin America who are already taking part in an international computer communications network, BESTNET. In this manner there will be an ongoing virtual exchange of students and faculty. Courses will be offered to students in different countries as preliminary to onsite exchanges already being developed by the California State University system and campuses. In addition, other courses will be co-taught by faculty across international boundaries and students will be in continual contact with colleagues and research issues in otherwise impossible ways. Students will take courses in biological, natural, social and communications sciences at their local nodes.

These course conferences will be open for students enroled at all institutions. They will do so by signing on to their local university VAX computers that are connected to the Internet or, initially in Africa, by computers connected to it through the CSUNET gateways. The lists of conferences that appear their computer screens will be distributed among the international universities. However, students enter any given conference from their local node and DECNET will interconnect to the distant node where it is housed. Thus, from the users point of view the distributed network will appear seamless.

We are now engaged in initiating for Winter term a collaboratively taught course between faculty at the United States institutions and the Department of Journalism and Communications at the University of Nairobi in Kenya. The course involves 14 hours of video recorded documentary information about various new communication technologies (from ISDN, fibre optics to supercomputers), and computer conferencing led discussions. The course has already been offered in the United States and Mexico by faculty from the California State University, and will be offered again in conjunction with African student participation. In the United States version of the course students do not meet face-to-face with the professor, but only interact using computer conferencing and electronic mail. We have made PAL versions of the tapes and are supplying them to the University of Nairobi and the University of Zimbabwe. Faculty at the latter institution will observe, and possibly have some students take part. However, as discussed below, the technical capability

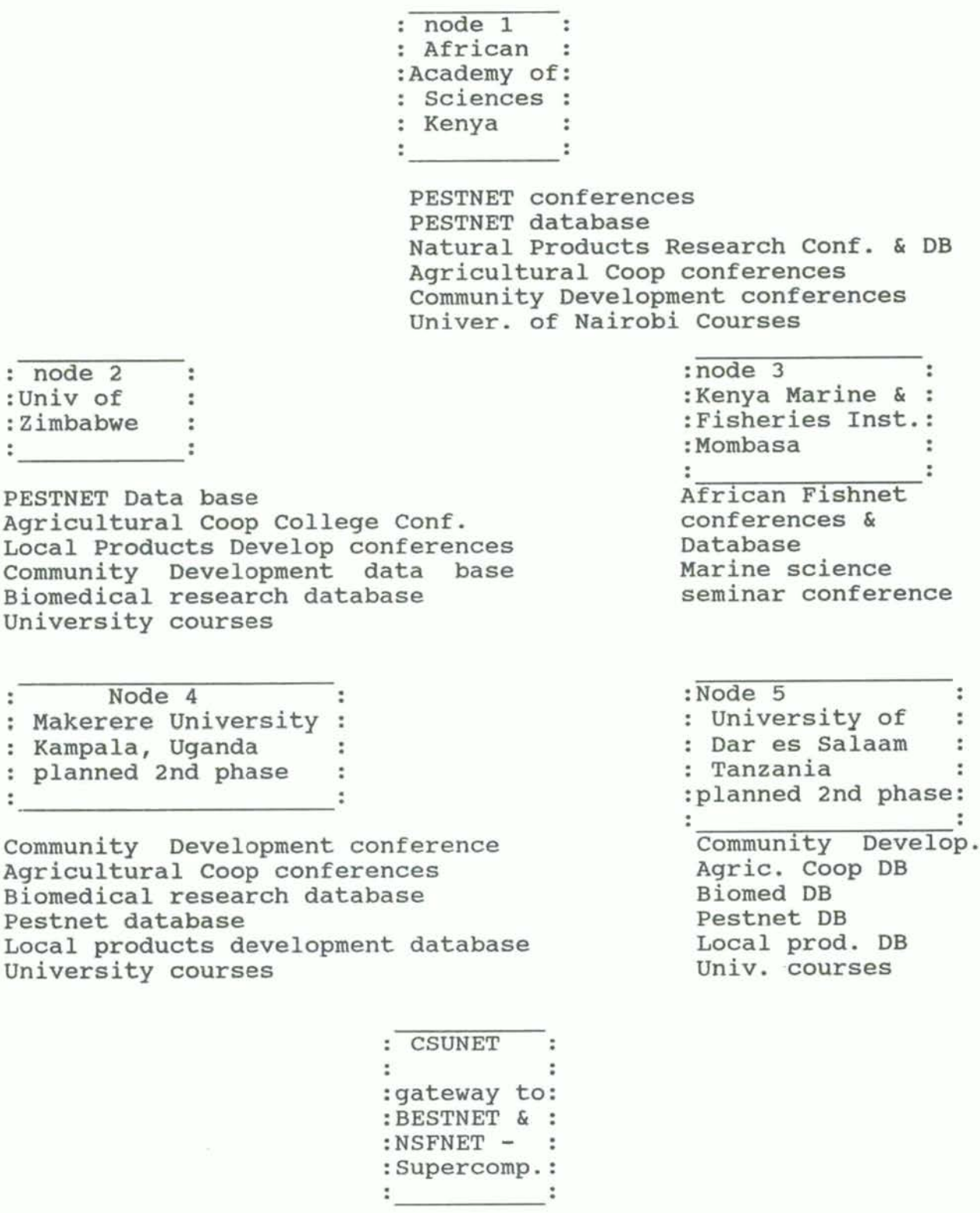
of Kenya via their new data packet network - KENPAK, is making possible more comprehensive interaction in this trial course.

In addition to the conferences faculty will put scientific data bases on the VAXes and make them available to other participating faculty and their students. These data bases will be accessed using distributed VTX videotext. When students and faculty log onto their local host they encounter a videotext front end that gives them a choice between using computer conferencing, videotext data bases, electronic mail or computer phone (for synchronous interaction). If they wish to access a particular data base they select that menu option, which brings up another menu listing the data bases available in the project. The next page of videotext will call up the distributed VTX network, and interconnect users with data bases on distant nodes. The distributed data bases will also be organized by VTX, such that there will be a standardization of features to use for search, retrieval and editing. In addition to the collaboration of VAXnotes conferencing and VTX videotext our distributed network also includes electronic mail and a computer phone or chat utility. Because our network is connected using the Internet, all accounts on the network will automatically allow Internet interactivity.

Our project is the first use of a fully distributed computer communications network, which will be encapsulated as a independent system over the NSF-NET/Internet with gateways to KENPAK, ZIMPAK (in Zimbabwe) and other X.25 networks. The ease of functionality in our distributed conferencing, videotext, mail and computer phone will greatly facilitate the use of computer communications both scientific research and international distant education programs between African and international institutions.

The following is a diagram of the distributed collaborative work environment we are developing in Africa.

Diagram 1: Distributed Collaborative Environment



The project is organized according to priorities specifically outlined in the IDRC manual SHARING KNOWLEDGE FOR DEVELOPMENT:IDRC'S INFORMATION STRATEGY FOR AFRICA, which contains objectives identified by them as critical for successful communications programs in the African context. These include:

1. To improve the effective utilization and sharing of existing knowledge and resources in Africa at the local, national and regional levels.

2. To design and implement information systems and services that are relevant to the local environment and that address specific needs and problems.

3. To improve sharing and data transfer at the national and regional levels by promoting standards, compatibility and use of methodologies, technologies, and tools adapted to the African environment.

4. To improve the indigenous capacity to plan, develop, and implement national and regional information policy.

5. To secure long-term commitment for sustainable information programs.

6. To stimulate greater use of local technical expertise in information handling by promoting South-South cooperation within Africa.

7. To build human resources in information sciences through needs-based training at all levels and, particularly, training of managers and trainers to strengthen the multiplier effect.

8. To improve the capacity of people involved in the provision of information to act as agents of change.

9. To promote a two-way flow of communication so that rural (and urban) poor people participate in an interactive dialogue on issues affecting them.

10. To improve the capacity of local scientists and technologists to obtain relevant information and bring about a more effective transfer of technology at the grass-roots level.

IX. Users of Afrinet being Coordinated by the AAS

1. AFRICAN ACADEMY OF SCIENCES: Particularly through the Network of African Scientific Organizations (NASO); Profiles and Databank of African Scientists and Scientific Institutions; Special Commission on Africa (SCA) think-tank; and research networks being developed as part of the Capacity Building projects; Covers all countries of Africa.

2. PESTNET: Pest Management Research Network, coordinated from the International Center of Insect Physiology and Ecology (ICIPE) in Nairobi and linking about 10 countries. ICIPE operates a user dial-up node of CGNET. PESTNET was established in 1986 and involves sharing methods and running pilot trials of pest control methods. It set up workshops in various African countries, including Zimbabwe, which is hub for the Southern African region and Nigeria with IATA-International Institute for Tropical Agriculture.

3. The PMDISS - Pest Management Documentation Information System and Services project is now being formed as part of PESTNET. Involves developing trans-African database using data from all research sites - even the most remote, and making generally available to researchers on contenent. Uses national coordinators who will be responsible for collecting data at each location.

4. ARPPIS - African Regional Postgraduate Programme in Insect Science, which is a collaborative training program between the ICIPE and 18 African universities - Sierra Leone, Ghana, Ibabdan in Nigeria, Rivers University of Science and Tech in Nigeria, Dschang Univ Center in Cameroon, University of Khartoum in Sudan, Addis Ababa Univeristy in Ethopic, Makerere University in Uganda, Moi Univ in Kenya, Kenyatta Univ in Kenya,University of Dar es Salaam in Tanzania, University of Malawi, University of Zambia and University of Zimbabwe. It is a graduate Phd program where students study for three and a half years at ICIPE and also work under direction of one scholar at home univer. Established in 1983, approx 15 students a year join program, which now has 101 students attending.

5. RECOSCIX: Regional Committee on Scientific Information Exchange System of the UNESCO International Oceanographic Council. Deals with marine science and fisheries in the Western Indian Ocean, with about 12 collaborating institutions in Eastern Africa and islands from Somalia to Mozambique. Operates a user dial-up node into Belgium from the Kenya Marine and Fisheries Institute (KEMFRI) in Mombasa, Kenya and then distributes information on paper. Mostly covering research and training. 6. NAPRECA: Natural Products Research Network of Eastern and Central Africa, covering researchers in Ethiopia, Sudan, Uganda, Kenya, Tanzania, Rwanda, Malawi, Zimbabwe and Madagascar, and coordinated form Addis Ababa University, Ethiopia. Research in phytochemistry, ethnobotany and pharmacology etc.; exchange of students; instrumentation sharing; developing a database called NAPRIS (Natural Products Research Information System, by Dr. Alex Tindimubona and other members).

7. AFSTINET: African Science and Technology Network, proposed by UNESCO Regional Office for Science and Technology. The numer UN, aid, and multinational business institutions. This is easily derived from current requests to the AAS for information regarding potential consultants, experts, committee and conference participants, candidates for awards and donations etc.

8. ESANET: Network of universities in Eastern and Southern Africa, promoted from University of Nairobi (Prof. A.J. Rodrigues) and the International Development Research Center, Nairobi. The EASANET project involves nodes in Nairobi, Kampala, Dar es Salaam, Lusaka and Harare. It is only an experiment to practice and experience issues involved in networking. There is little traffic on the network as process is primary to content, and involves resolving problems and to demonstrate the efficacy of computer communications using a demonstration project. The packet radio side of EASANET is supported by Healthnet, which is installed downtown at the medical school - run by Charley Clemens of Satalife - who uses a 386 system with commercial packet radio reception.

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5.4 AUSTRALIAN NETWORK FOR PLANT CONSERVATION (ANPC)

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Varying reports have been produced in Australia since the early 1970's calling for action on endangered species and promoting a regional network of botanic gardens to concentrate on the flora of their local region. While many of these reports have recognised the role that botanic gardens and arboreta can play in conservation activities, there was a significant number of other groups and people involved that were overlooked. This in particular includes the so-called 'non-professionals'.

In 1987, the Australian National Botanic Gardens was contracted by the Australian National Parks and Wildlife Service (ANPWS) to conduct a survey of the major botanic gardens in Australia to determine their holdings of rare and threatened Australian plants. The report published, included the following recommendations:

1. Australian botanic gardens large and small should endeavour to play an increased role in the conservation of rare and threatened plant species.

2. Australian botanic gardens should implement the Botanic Gardens Conservation Strategy.

3. Funding should be provided for an Australian botanic gardens conservation secretariat.

4. The Australian botanic gardens community should develop a regional role in conservation matters relevant to the south-west Pacific and S-E Asian regions.

5. Smaller botanic gardens should be encouraged to develop a collection of species from their local region or establish a national collection of a particular group.

6. The major botanic gardens should assist smaller botanic gardens by providing scientific and technical assistance and advice.

7. A national collection of rare and threatened species should be dispersed to three or more gardens to assist in the security of the collection.

8. A national collection policy for rare or threatened plants should be developed.

9. A conference should be held to discuss all of the above matters and to provide guidelines for further action.

These recommendations recognised the largely uncoordinated approach to ex situ conservation in Australia.

In 1991 the ANBG acted to co-ordinate the ex situ conservation of rare and threatened plants by organising the conference "Protective Custody? - Ex Situ Plant Conservation in Australasia". The conference had among its goals the intention to:

Prepare guidelines for the establishment of an Australian Plant Conservation Secretariat and an Australian Botanic Gardens Conservation Secretariat.

Participants who attended this conference came from universities, botanic gardens zoos, the forestry industry, conservation agencies, horticultural organisations, the mining industry and local councils. This reflects the immense interest in the general community in this subject.

As had been apparent from the survey in 1987, it was again obvious from the conference that there has been little communication between different organisations.

Encouragingly, it was generally agreed by conference delegates that there is a need for informal networking so that the diverse range of groups involved can be made aware of the situation that exists. Out of this common acceptance of the situation came a proposal for the establishment of the Australian Network for Plant Conservation.

The aims of the Network are to:

1. Establish a multi-site national endangered species collection.
2. Locate and bring together information concerning integrated conservation activities in Australia.
3. Assist in the co-ordination of plant conservation projects to avoid duplication.
4. Provide information and advice to ANPC members.
5. Promote plant conservation.
6. Organise workshops and training courses.
7. Produce a regular Newsletter.

The structure of the ANPC is as follows:

Advisory Committee

Role. The Advisory Committee will:

a) assist the coordinating office to develop and maintain cooperation between botanic gardens, kindred organisations and land management agencies;
b) advise on plant conservation activities for the ANPC including the review of funding and fund raising possibilities;
c) advise on the operation of the coordinating office.

Membership. The membership of the Advisory Committee is be drawn from botanic gardens, zoological gardens, non-government institutions, the media, tertiary institutions, national parks and wildlife services (including the ANPWS), industry and the CSIRO.

A special attempt has been made to include representation from land management organisations.

Expert Sub-Committees

The Advisory Committee will appoint these sub-committees as required to advise it on matters such as funding, research plant re-introduction, ecological restoration and germplasm storage.

Coordinating Office

Role. The Coordinating Office will:

a) carry out day to day management of the programs and activities of the organisation as recommended by the Conference delegates;
b) assist in the implementation of the Botanic Gardens Conservation Strategy;
c) draft and adapt policy documents and technical manuals for review by the Advisory Committee;
d) develop and maintain a national database of rare or threatened plants in cultivation in Australia to complement the CSIRO database of rare or threatened Australian plants in the wild;
e) provide a link with other national and international conservation bodies;
f) manage the budget of the organisation;
g) act as a regional office of the Botanic Gardens Conservation Secretariat;
h) maintain communication between the Advisory Committee, coordinating office and sponsoring agencies especially through the production of a regular newsletter.

Staff.

a) Initial set-up and on-going assistance has been from existing Australian National Botanic Gardens staff
b) One full time ANPC staff member
c) Volunteer assistance as available
d) Short-term contracts (eg. for database development) subject to the availability of funds.

Staff employed specifically for the ANPC will be employed (though not necessarily funded) through the Australian National Parks and Wildlife Service.

Accommodation. Delegates at the Conference agreed that establishing the ANPC in Canberra would be advantageous given the importance of the ANPC having close contacts with such organisations as the CSIRO and the ANPWS through the Endangered Species Program.

The Coordinating Office for the ANPC is located in Canberra in space provided by the Australian National Botanic Gardens.

ANPC Members

This group represents all paid up members of the Australian Network for Plant Conservation.

ANPC ACTIVITIES

The activities of ANPC Coordinating Office during first year have been:

Office establishment:
a) Preparation and circulation of the Prospectus to prospective Network members and finalise.
b) Negotiation of an agreement with ANBG regarding staffing and accommodation.
c) Establishment of a functioning office with appropriate administrative systems.

Network and communications:
a) Editing and publishing of the Proceedings of the 1991 Protective Custody conference.
b) Organizing a public announcement of the creation of ANPC.
c) Recruitment of members and establishment of Network membership list and contacts.
d) Recruitment of members of the Advisory Committee.
e) Establishment of communication between Coordinating Office and Network members, and other co-operating organisations and individuals.
f) Design, preparation and circulation of the newsletter.

Development of information system:
a) Determination of scope and objectives of information system.
b) Selection and acquisition of hardware and software.
c) Identify and retain consultant for Information Systems development.
d) Development of specific application for management of ANPC activities.
e) Establishment links with other relevant database holding organizations.

Planning and Budgeting:
a) Preparation of a three-year strategic development plan, including budgetary projections, for review by the Advisory Committee.

Fundraising:
a) Identification of potential sources of funding for ANPC from governmental and private sources in Australia and elsewhere.
b) Develop specific proposals for financial support of program elements.
c) Initiate contact with prospective funders and solicit contributions.
d) Determination of member contribution scale of fees and invoicing system.

Training, education, and meetings:

a) By means of a survey, determine the training requirements and needs of Network members.
b) Circulate register of training courses available to members.
c) Plan and execute a biennial conference of Network members for 1993.
d) Plan and execute first meeting of Advisory Committee.
e) Conduct a training course for the management of plant living collection databases, including a review of the major relevant national databases, to be held in 1992.

Database Development

A fundamental activity of any national organization is the creation and maintenance of a database to serve the overall needs. The ANPC database will focus on the collections of conservation-worthy plants in Australian botanic gardens as well as those grown by kindred organizations and interested individuals. This database will be established on standard, commercially available computer hardware, using software to allow straightforward communications with other national and international databases.

The day to day management of the database and data inputting will be undertaken by the staff of the organization but database structural development is being carried out by contract during the first and subsequent years of operation of the organization, for which separate funding will be sought. Initial computer hardware acquisitions have been made during the first year of operation of the organization.

At its core the database will contain a list of rare and endangered Australian plants, made available by the CSIRO and updated as revisions are published. It will also include relevant fields on distribution, ROTAP conservation category, life forms, etc. of each of the species listed.

Based upon this central reference list of plants the organization will gather the following data:

a) The occurrence of plant accessions in botanic gardens and other ex situ conservation collections in Australia. The structure of the database is being adapted from software already developed at the ANBG but careful concern has been given to ensure that it is fully compatible with the International Transfer Format for Botanic Gardens Records. The ITF has become a standard for the electronic

exchange of accession information between gardens and is widely used in Australia and elsewhere. Data held on each accession will include as extensive information as possible on their origins and level of verification. The National Data Management System developed by the Center for Plant Conservation (USA), which meets many of the basic needs of ANPC, has served as the basic template for the information system design.

b) Documentation and a bibliography on the horticultural methodologies used for the cultivation and propagation of plants listed in the database will be undertaken in co-operation with the BGCS.

c) A register of plant recovery, re-introduction and ecological restoration programmes will be maintained.

d) A list of rare or threatened species available in the horticultural trade will be maintained as well as listings of the major nurseries stocking them.

e) Species that are either controlled under the provisions of CITES or else are endangered through their collection for trade will be highlighted.

f) In conjunction with the BGCS, a list of non-native rare and endangered plants in cultivation in Australia's botanic gardens will be maintained to foster the Australian contribution to global efforts for plant conservation. In addition the database will link with international efforts to document conservation collections of Australian plants held elsewhere in the world.

Education

The ANPC will support and encourage educational programs to increase awareness of the problems of plant conservation and biodiversity and the importance of integrated programs to address conservation issues.

Training

Currently there is little if any training done by botanic gardens and kindred organisations in relation to the conservation of Australia's flora. Such training will include courses on collecting, propagating and cultivating threatened plants; species re-introduction; database development and management, and land management. It may include tertiary courses that already exist. A great deal is also likely to be gained by the exchange of staff between different organisations involved in both in situ and ex situ conservation.

Training is primarily the responsibility of individual organisations both in terms of organisation and funding as any training must be tailored to the conservation programs that those organisations have developed.

However, the role of the Coordinating Office will be to identify and distribute information concerning any conservation training that is already available and provide contacts for organisations wishing to exchange staff.

The Coordinating Office will also, in the longer term, make suggestions on what types of training would be valuable for organisations to undertake if they are interested in conducting conservation work. This may include arranging with particular organisations to carry out part of the training program.

Exchange of staff should be considered not only within Australia but also between countries in the South-West Pacific and with other nations world- wide where national integrated conservation programs are under consideration.

ANPC MEMBERSHIP FEE STRUCTURE

As part of the commitment from each of the ANPC members there is an annual subscription. The fee structure that has been decided upon is:

Federal, State or Local Government Agencies Corporations or Industry Associations	$ 200
Other Non-profit Organisations	$ 50
Interested Individual	$ 30

The membership of the ANPC at 1/7/92 is 87.

CURRENT ACTIVITIES:

a) Establishment of the National Endangered Species Collection and index of conservation activities.
b) Production of a regular Newsletter including the promotion of ANPWS activities and publications.
c) Planning for a workshop for the SGAP Study Groups.
d) Providing assistance to the Grevillea sp. (Tumut) recovery plan.
e) Preliminary planning for the 2nd National ANPC Conference (in conjunction with the ESU).
f) Providing assistance to proposed regional plant conservation networks in New Zealand and Indonesia.

5.5 THE APC-NETWORKS BIODIVERSITY PROGRAM

Anthony Whitworth <consdesk@igc.apc.org>

In the end,
We will conserve only what we love,
We will love only what we understand,
We will understand only
what we are taught.

- Baba Dioum (Senegalese conservationist)

The key to unlocking the barrier of sustainability is our understanding of and respect for the processes that result in the "stuff" that everything comes from - the earth's wealth of natural diversity. Few people understand how problematic the issue is: the consequences of mishandling the earth's biodiversity resources are grave. Unlike other issues that compete for our attention, these losses are not recoverable and occur at a very high rate.

Conservation biology is a new and inclusive field made up of people who seek to find equitable resolution of the issues, and offer a perspective that changes the way we see the human-induced unravelling of the fabric of life. Halting the loss of biological diversity is not a matter of values or beliefs, but a matter of vital concern to all, that will require some positive response from humanity.

To facilitate such a response EcoNet, the Institute for Global Communications (IGC) and the Association for Progressive Communications (APC) have created several network-wide resources - computer conferences to exchange information about issues relating to the conservation of biological diversity. The conferences are dedicated to magnifying the efforts of scientists, educators, natural resource managers, community activists, policy-makers, and opinion-shapers. The APC is a worldwide partnership of member networks committed to providing low-cost and advanced computer communications services. We seek to improve networking and information-sharing among organizations and individuals devoted to environmental sustainability, social and economic justice and universal human rights.

The APC networks connect more than 15,000 users in more than 92 countries through a distributed network of host computers. APC was the principal provider of telecommunications services to NGOs at the 1992 Earth Summit.

* Electronic Mail connectivity with every major computer network service worldwide, including the Internet, Bitnet, Compuserve, Dialcom (including TCN and UNINET), MCIMail, Connect (including HandsNet) and more than 30 others.
* Information resources and discussion fora on issues and values ranging from: Environmental Education to strife and social change in Eastern Europe; Energy policy, Climate change and Biodiversity, to the full facts on the Earth Summit; from democratic change in Africa to the latest on East Timor.
* News Wires including the InterPress Service, Pacific News Service, Africa Information Afrique, the Women's Feature Service, CERIGUA and Greenpeace.
* Fax and Telex interconnectivity at extremely low rates.
* Local dialup access facilities and experienced local support staff in Australia, Brazil, Canada, Ecuador, Germany, Nicaragua, Russia, Sweden, the United States, Uruguay.
* Access from more than 20 countries via the Internet, and access through packet-switched services (including US Sprint and BT Tymnet) from more than 90 countries.

* Computer Conferencing, with multiple-site participation, and private, semi-private and unrestricted access options. Capability of interchange in USENET, and other formats.
* Remote system support using either the UUCP or FIDO protocols.
* Mailing List and File distribution services, using multiple message formats.
* On-line Databases.
* Custom login banners, computer conferences and billing services for groups.
* Internet Services, including TELNET, FTP and WAIS.
* Consulting and Technical Assistance, ranging from installation of complete email and BBS systems to full support for your organization's specific needs for computer communications and information exchange.

Asia/Pacific:	Pegasus, Box 424, The Epicentre, Byron Bay 2481, NSW, Australia; +61-66-856-789
Europe:	GreenNet, 23 Bevenden Street, London N1 6BH, England; +44-71-608-3040
Latin America:	Alternex, 29 Rua Vicente de Souza, 22251 Rio de Janeiro, Brasil; +55-21-286-0348
United States:	IGC, 18 de Boom, San Francisco, CA 94107 USA; +1-415-442-0220

5.6 THE EVOLUTION OF ACADEMIC NETWORKS IN BRAZIL
Excerpts

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NOTE. This article was originally written in Portuguese, and translated to English and abridged by Alberto Courrege Gomide, from FAPESP.

ABSTRACT

The first generation of academic networks in Brazil is almost complete, with the introduction of a minimal network in almost every state of the country, providing electronic mail. The second generation, already being installed, will serve a greater number of users, will offer a greatly enhanced variety of services, and will provide a closer integration of the internal computing resources of each academic institution served. The article traces the evolution of these networks and indicates directions for their future development.

1 - INTRODUCTION

The effort, initiated in 1987, to provide the academic community of Brazil with a reliable and expanding system, has produced a network for electronic mail that integrates the main research centers in almost every state of the country. This network has brought the academic users to a closer cooperation, within the country and outside Brazil.

Based on the success of this effort - and having as objective, to offer a variety of services - the new national network is taking form, with the current Internet standards. This propitiates inter-operation between Brazil and most countries world wide.

In this article we present the evolution of the current network, with the ideas adopted for the implementation of the new network operation that will begin in 1992. New directions for future implementations are also shown, together with opportunities for P&D in networking.

2 - ELECTRONIC MAIL NETWORKS

2.1 - The Bitnet technology

One of the simplest ways to implement an e-mail network is to use "store and forward". In such a network, sending a message implies in a succession of transmissions over the node links, from the origin to the destiny. The message is transmitted over one link, stored in mass storage on the next node, and so on. The implementation of such a network requires a simple transmission protocol, associated to one routing table per node.

Among such networks, BITNET (Because It's Time Network) has been the easiest to connect to. It uses IBM's RSCS protocol. We must note that there are implementations of the RSCS protocol for other computers, such as Jnet (Joiner Associates) for Vaxes, and UREP (Pennsylvania State University) for Unix.

To become a Bitnet node, an Institution needs only one DDCL (Dedicated Data Communications Line) to one of the nodes of the network. In accordance with the cooperative spirit of Bitnet, each Institution is required to provide at least one such link to new Institutions.

Due to the simplicity of its structure and the distributed costs (each Institution only pays for its own DDCL), the Bitnet-like connections grew rapidly, spreading throughout the world. This global network is known as BITNET in the USA, NETNORTH in Canada, EARN in Europe, CAREN in Japan and ANSP in Brazil.

With the growth of local networks in all countries, Bitnet-Netnorth-Earn assumed a position as inter-network connections, where the majority of messages are originated and destined from/to nodes outside Bitnet. This was implemented by a "gateway" software, the Columbia MAILER.

Services provided by Bitnet are electronic mail, file transfer, interactive on-line messages, remote job submission and remote printing. Only electronic mail is provided through the gateways to other networks.

2.2 - A National Network Implementation

Due to lack of national legislation, until October 1988, the national PTT (Embratel) refused to provide access to data communications outside Brazil. The network pattern that exists today is a consequence of that restriction.

In September 1988, the Laboratorio Nacional de Computacao Cientifica (LNCC), became a node of the Bitnet network, connecting to it via Maryland University. Due to the restrictions of Embratel, LNCC could only provide services to local users via remote dial-in terminals.

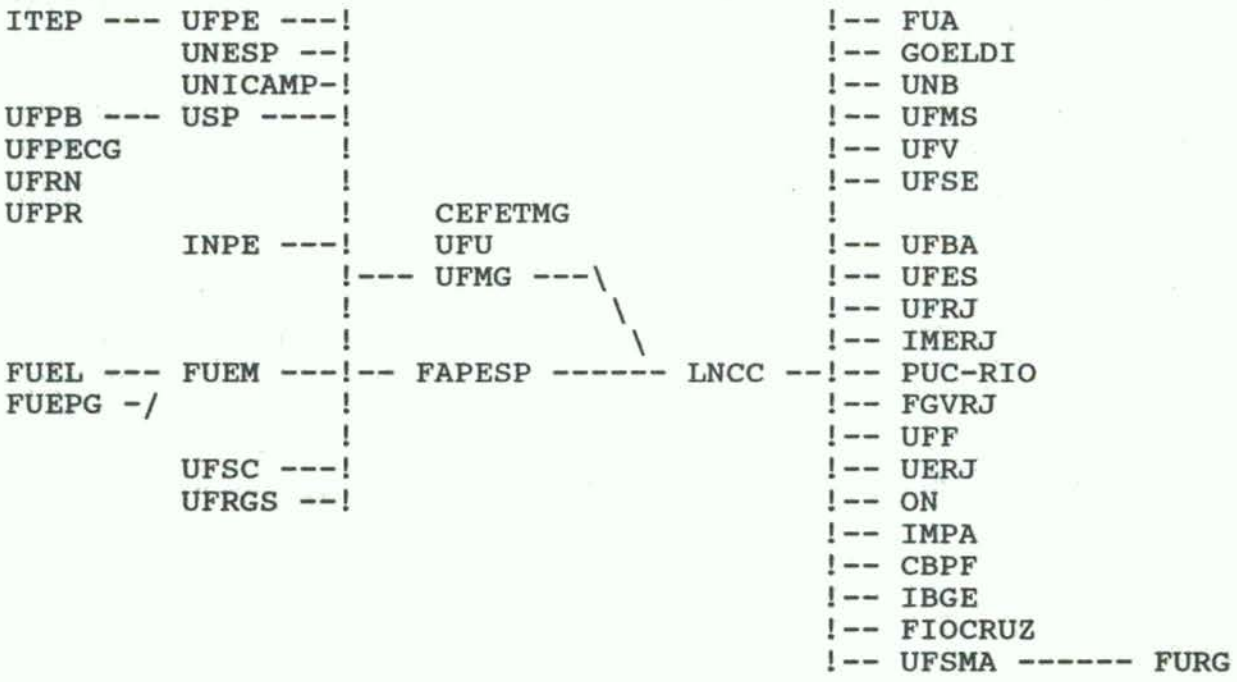
In October 1988, Embratel suspended that restriction temporarily. The Fundacao de Amparo a Pesquisa do Estado de Sao Paulo (FAPESP) was then also ready to connect to Bitnet. In November 1988 FAPESP was connected to HEPnet (High Energy Physics Net) via Fermi National Accelerator Laboratory, a network of Vaxes with the DECnet protocol, belonging to Digital. Right after that, FAPESP constituted a Cooperating Network, ANSP, Academic Network Sao Paulo, recognized by Bitnet-Netnorth-Earn as a cooperating network with local administration. In the beginning, ANSP congregated FAPESP, Universidade de Sao Paulo (USP), Universidade de Campinas (UNICAMP), Universidades Estaduais Julio Mesquita (UNESP), Instituto de Pesquisas Tecnologicas do Estado de Sao Paulo (IPT), Universidade Federal do Rio Grande do Sul (UFRGS) and Universidade Federal de Minas Gerais (UFMG), all through dedicated data communication links (DDCL).

In March 1989, due to another project established before October 1988, the Universidade Federal do Rio de Janeiro (UFRJ) became connected to Bitnet through the University of California, Los Angeles (UCLA).

This way, there were three "islands", that communicated among themselves only through their links with the USA. The islands with focal points in FAPESP and LNCC began to grow by the aggregation of institutions all over the country. These Institutions were mainly connected via DDCLs, but dial-up lines and the National Packet Distribution Network, RENPAC, were also used.

In April 1990, UFMG established a connection to LNCC, thus merging the two islands with focal points in LNCC and FAPESP and all Institutions connected to ANSP (the Brazilian portion of BITNET), with the exception of UFRJ, that was connected to LNCC later, in September 1990. This topology continued to grow over the Bitnet-style connections and is shown in Figure 1.

FIGURE 1 - DDCL CONNECTIONS OF THE ACADEMIC NETWORK, DECEMBER 1991



3.3 - THE INTERNET ARRIVES IN BRAZIL

In February 1991, the Fermi National Accelerator Laboratory became connected to ESNET, and consequently FAPESP became connected to the Internet, sponsored by ESNET.

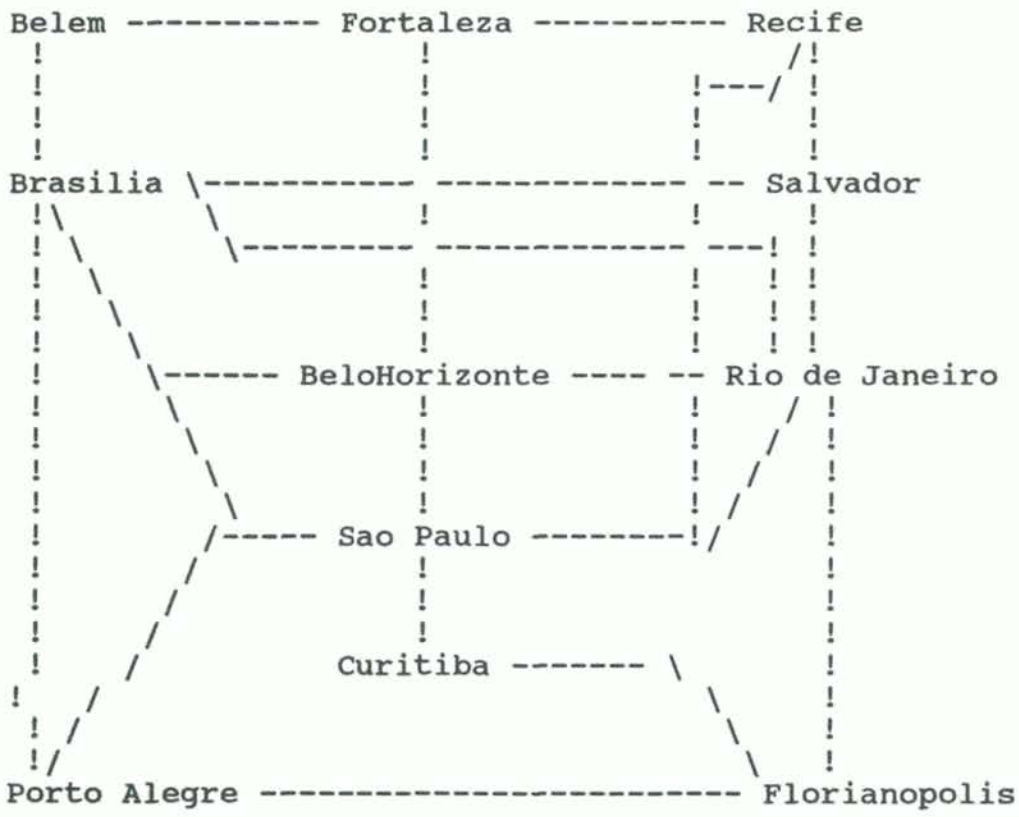
4.1 - THE NATIONAL NETWORK PROJECT - RNP

In July 1990, the Secretaria de Ciencia e Tecnologia (Federal Secretary of Science and Technology) (SCT/PR) designated the Conselho Nacional de Desenvolvimento Cientifico e Tecnologico (National Research Council) (CNPq) as executor of the project RNP - Rede Nacional de Pesquisas (National Research Network), to direct the different network efforts that were being carried out in the country.

4.3 - THE RNP "BACKBONE"

The RNP become structured as a "national network, connecting state networks", via a backbone of inter-state DDLCs.

FIGURE 2 - THE INITIAL TOPOLOGY OF THE RNP BACKBONE



--- ADDENDUM ---

The file ANSP.NAM lists all Institutions connected by e-mail in Brazil. The file ANSP.NAM is available via LISTSERV@BRFAPQ.BITNET. Anyone interested who wishes to receive this list may send a mail to 'listserv@brfapq.bitnet' with the following message:

SEND ANSP NAM

5.7 **CONSLINK**

A Bitnet Based Electronic Conference and Bulletin Board on all Topics of Biological Conservation

Michael Stuewe

CONSLINK, c/o Michael Stuewe, Conservation and Research Center,
National Zoological Park, Smithsonian Institution,
Front Royal, VA 22630, USA
E-mail: NZPEM001@SIVM.BITNET

The Smithsonian Institution is involved in conservation related education and research projects world-wide. In 1989, we established CONSLINK as an electronic conference and bulletin board to improve communication between individuals and institutions around the world who are interested in the general topic of biological conservation.

CONSLINK is distributed through BITNET, an academic and research computer network, which is internationally connected to many other networks. Using only a few commands you should be able to make full use of CONSLINK. At the end and in a separate file, CONSLINK HELP, we provide a brief summary of these commands and how to use them. In case you have no success accessing CONSLINK, please contact your computer center.

THE CONSLINK CONFERENCE

When you sign up for the CONSLINK CONFERENCE, your user-id will be added to a distribution list. Any electronic mail that you send to the BITNET address CONSLINK AT SIVM will automatically be sent to everyone on that distribution list. In case you would like to comment on a message you received on CONSLINK, you have the choice to either reply to the whole CONSLINK CONFERENCE or to the individual who originally sent the message. The scope and degree of expertise available to CONSLINK users depends upon the number of participants. Therefore, we welcome your enrolment and encourage you to distribute this message to your colleagues. If you have a question or information about any particular conservation-related topic, send it to CONSLINK, and see if someone has the answer. Topics of general interest include dates of conferences, symposia, and workshops; new publications; grants and positions that have become available. Why not let everyone know what you know!

THE CONSLINK BULLETIN BOARD

A set of files on general conservation related topics reside on the CONSLINK BULLETIN BOARD. They include lists of conferences, references, NGOs, tropical field research stations, conservation training opportunities, various newsletters, and news items. You can instruct the Smithsonian's computer with simple commands to send you individual files at any time. You can also instruct the computer to automatically send you specific files as soon as they are updated on the bulletin board. An index of all files is available and is regularly updated.

AN INTRODUCTION TO CONSLINK COMMANDS

CONSLINK works two ways:

- You can register for the CONSLINK CONFERENCE and have your name included on a distribution list. That way you can send the same message to every participant on the list and receive all messages sent by everyone else on the list.

- You can instruct the Smithsonian Institution's computer to send you files of general interest from the CONSLINK BULLETIN BOARD. You do not have to be registered for the conference to do that. You can receive files either by requesting them one at a time, or by issuing a request for automatic distribution whenever that particular file is updated on the bulletin board.

The commands you have to use to interact with CONSLINK depend on the computer system through which your institution is connected to BITNET.

- If you are using an IBM 370 class or compatible mainframe which uses the CP/CMS operating system, and is connected directly to BITNET, you may issue the commands:

TELL LISTSERV AT SIVM SUBSCRIBE CONSLINK Your Name

to have your name added to the distribution list of the CONSLINK CONFERENCE. Once registered, any mail that you want to send to all participants on this list should be addressed to CONSLINK AT SIVM.

If you don't want to receive CONSLINK mail anymore or close your account, PLEASE UNSUBSCRIBE FROM CONSLINK using the following command:

TELL LISTSERV AT SIVM UNSUB CONSLINK

TELL LISTSERV AT SIVM GET CONSLINK HELP
to have the Smithsonian's computer automatically send the file CONSLINK HELP to your account. This file contains a summary of the CONSLINK commands.

TELL LISTSERV AFD ADD CONSLINK MEETINGS
TELL LISTSERV AFD ADD CONSLINK B-C-NEWS
TELL LISTSERV AFD ADD CONSLINK CBSG-1
TELL LISTSERV AFD ADD CONSLINK CGSG-2

to have one or several of these files automatically sent to you whenever they are updated on the bulletin board. Please ignore the message about issuing a password which will automatically be sent to you when these commands are issued. To stop receiving these files, send the commands:

TELL LISTSERV AFD DEL CONSLINK MEETINGS
TELL LISTSERV AFD DEL CONSLINK B-C-NEWS
TELL LISTSERV AFD DEL CONSLINK CBSG-1
TELL LISTSERV AFD DEL CONSLINK CBSG-2

TELL LISTSERV AT SIVM INDEX CONSLINK

to have the Smithsonian's computer automatically send the file CONSLINK FILELIST to your account. This file is an index of all files available on the CONSLINK BULLETIN BOARD.

- If you are using a VAX machine which is connected directly to BITNET you will have to substitute TELL LISTSERV@SIVM with:

SEND LISTSERV@SIVM

- If you are not connected directly to BITNET but use a different computer network that has a gateway to BITNET, you may not be able to issue the TELL LISTSERV@SIVM command. Instead you should send a regular mail message to LISTSERV@SIVM which on one line each contains only the commands

SUBSCRIBE CONSLINK Your Name and/or
GET CONSLINK HELP and/or and/or
GET CONSLINK MEETINGS and/or
AFD ADD CONSLINK MEETINGS and/or
AFD ADD CONSLINK B-C-NEWS etc. etc.

!!!PLEASE REMEMBER!!!

- Never send any of the above commands to CONSLINK, all of them should be directed to LISTSERV@SIVM.BITNET! - Please unsubscribe from CONSLINK and stop automatic distribution of your files when you close your account!

If you would like to contribute to the CONSLINK conference, ask a question, make an announcement, etc. please send a regular e-mail message addressed to CONSLINK@SIVM.BITNET. This message will then be automatically distributed to all current subscribers of CONSLINK.

5.8 PRIORITIES IN BACTERIAL BIODIVERSITY CONFERENCE

organized by the Center for Microbial Ecology and the Bergey's Manual Trust,
East Lansing, Michigan, USA, June 15-18, 1992.

DRAFT REPORT ON ANALYSIS AND MANAGEMENT OF DATA

Contributed by Micah I. Krichevsky

Director Biocomm International, International Trade and Development Foundation
Analysis and Management of Data

The description, measurement and analysis of diversity require a broad spectrum of information resources. The domains of diversity include time, place, ambiance, genotype, phenotype, taxonomy, the relationships and distributions within, and the associations among, the domains. No single database or database system will accommodate the variety of information and the analytic tools required to cope completely with this information. Without this spectrum of domains, diversity studies are limited to simple distributions of genetic and phenotypic variation.

Three types of databases are needed:

1) to facilitate genotypic and phenotypic identification of new isolate from the environment (databases for rapid identification are available, mainly for bacterial and yeast isolates); this requires comprehensive taxonomic databases capable of aiding in identifying organisms by keys or probabilities (preferably both);

2) to hold the ecological data which would include the description and incidence of the biota, functional properties, the location (using a Geographic Information System), ambiance measurements, e.g., time, temperature, terrain, depth or altitude, and chemical, physical and biological characteristics of the sample site;

3) ancillary databases (e.g., taxonomies, sequence banks, compendia of methodologies, culture collections and their holdings, standard vocabularies and terminologies, directories of databases, compendia of species descriptions, bibliographic databases, software, strain databases, end-product databases).

Improved international standards should be developed for terms organized around specific habitats (e.g., marine, estuarine, fresh water, ground water, dry soils, wet lands, animal and plant hosts, etc.). The advice of the CODATA Commission on Standardized Terminology for Access to Biological Data should be sought. The standardization should include terminology descriptors of the habitat and the procedures used.

A survey should be conducted of the form and extent of current databases applicable to microbial ecology and a registry should be established. The registry will help ecologists in their research and aid rational funding of studies.

There are neither the resources nor the infrastructure to collect, in one place, a significant portion of the extant data relevant to biodiversity. Linking existing databases, already in computers or which can be rendered machine readable, will provide a realistic approach to making a significant portion of the world's data available for biodiversity studies. There are various models for such

linkage. Experiences of the Microbial Strain Data Network (MSDN) clearly indicate that linkage of disparate databases, distributed around the world is feasible at low cost.

Action is required to assist international access to databases and their dissemination. This will require mechanisms for wide distribution (e.g., electronic networking, CD ROM, magnetic media). Further, electronic networking will facilitate national, regional and global collaboration. There is a need to develop software specific to the needs of microbial ecology e.g., improvement of indices of diversity including algorithms for their calculation and use of databases for such things as habitat- specific media, biotechnology (new products, bioremediation, new useful genes).

Support should be given to maintaining and updating databases through support centers or "help desks". Particular consideration should be given to archiving invaluable primary data.

There is great need for education and training on availability and use of databases and data analysis. This could involve international scientific organizations such as IUMS, CODATA, WFCC and MSDN, as well as national societies which have ongoing training programs.

Investigators should be encouraged to build more complete databases than permitted by test kits. Data analysis of isolates should include cluster analysis and incorporate type strains.

Data technology and strategy is fairly well developed. Model strategies exist. Environmentalists must decide how to apply these techniques to their particular studies.

Organization: the following two issues should be emphasized:
- Collaboration with plant and animal initiatives is very important.
- Establishment of special interest groups organized around like or similar habitats will provide a framework for accomplishing many of these goals.

5.9 SOME COMMENTS ON DISTRIBUTED NETWORK DATABASES

David G. Green

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INTRODUCTION

These comments follow on from my workshop paper "Public domain databases for networking biodiversity". In that article I discussed the design of public domain databases on Internet. Here I give some brief examples to show how tools available on Internet make it possible to combine files at different sites to form a distributed database.

One of the exciting developments on Internet has been the appearance of tools to help network users to access information across the network. The development of these tools has gone hand-in-hand with the spread of anonymous ftp and other protocols for accessing information on remote servers.

As an example of how Internet can be used to build distributed databases, I give here some examples of how DNA and protein sequence data is shared over Internet. Molecular biology is already well established on Internet and can serve as an excellent paradigm for sharing information about biodiversity.

DATA STORAGE

Data files are normally stored and transferred as ascii files in tagged field format (e.g. Appendix 1). Public domain files are normally placed in public directories (e.g. /pub).

FILE TRANSFER

The basic means of file transfer on Internet is "anonymous ftp". Enormous volumes of public domain data and software are available on Internet and can be copied by anyone wishing to use them. They include most of the tools needed to work on Internet (e.g. NCSA Telnet).

Appendix 2 presents an example of a short session in which I use anonymous ftp to retrieve an introductory information about Taxacom.

INFORMATION RETRIEVAL SYSTEMS ON INTERNET

Various utility programs are available on Internet to simplify and structure the above process of file retrieval. In the appendices below I present examples of two utilities:

ARCHIE - File search and retrieval across the network. Appendix 3 shows an example of accessing Archie via Telnet to search for sites holding copies of a particular database - in this case the CIA's map of the world. Archie can also be contacted by electronic mail by embedding the commands in a message. Point and shoot graphic interfaces are now for X11 unix machines. These simplify file access even further. You simply type in the name of the file you are seeking, press Query to locate sites, then press the Ftp button to retrieve the file.

GOPHER - Text browsing and retrieval from server databases, developed at University of Minnesota. Appendix 4 presents an example of a session using Gopher to locate and retrieve the data file shown in Appendix 1. Gopher retrieves both menus and data files directly over Internet from specified sites anywhere in the world. Hence Gopher can be used as a database interface to locate and retrieve information on related topics. The beauty of the approach is that Gopher servers talk to each other. So if one site has a specialized gopher menu set up on a particular topic, then other sites can tap into those menus by including a link to that site as an option on their local Gopher menu! Appendix 4 gives an example of how this works in practice.

Many other utilities are also available in the public domain, e.g. WAIS (Wide Area Information Servers), developed by Thinking Machines Corporation. Recent developments (e.g. World Wide Web) support network access to multimedia information. All of these systems, usually including source code, are available over Internet.

CONCLUSION

These brief examples show how existing technology can be combined with public domain databases to create distributed databases that can be coordinated and accessed from anywhere in the world. There is no need for any central site that coordinates an entire database. The main requirement is for participating sites coordinate their activities and agree on the protocols they will use.

APPENDIX 1 Example of a tagged field format - entry from GENBANK

DECODNAK 1917 bp ds-DNA BCT 15-SEP-1989
DEFINITION E.coli dnaK gene encoding the heat shock 70 protein. ACCESSION K01298
KEYWORDS heat shock protein.
SOURCE Escherichia coli DNA (lambda-dnaK DNA).
ORGANISM Escherichia coli
Prokaryota; Bacteria; Gracilicutes; Scotobacteria; Facultatively anaerobic rods; Enterobacteriaceae.
REFERENCE 1 (bases 1 to 1917)
AUTHORS Bardwell,J.C. and Craig,E.A.
TITLE Major heat shock gene of Drosophila and the Echerichia coli heat-inducible dnaK gene are homologous
JOURNAL Proc. Natl. Acad. Sci. U.S.A. 81, 848-852 (1984)
COMMENT This E. coli gene produces a 69,121-Da polypeptide which is 48% homologous to the hsp70 protein of Drosophila. Although there are at least 14 heat-induced polypeptides in E. coli, this is the only gene encoding an hsp70-related protein. It is said to be under the control of the htp-r gene.
FEATURES Location/Qualifiers
mat_peptide 4..1914
/note="mature hsp70 protein(68990-Da) [1]"
/codon_start=1
CDS 1..1917
/note="(dnaK gene)"
/gene="dnaK"
/product="hsp70 protein"
/codon_start=1
/translation="MGKIIGIDLGTTNSCVAIMDGTTPRVLENAEGDRTTPSIIAYTQ
DGETLVGQPAKRQAVTNPQNTLFAIKRLIGRRFQDEEVQRDVSIMPFKIIAADNGDAW
VEVKGQKMAPPQISAEVLKKMKKTAEDYLGEPVTEAVITVPAYFNDAQRQATKDAGRI
AGLEVKRIINEPTAAALAYGLDKGTGNRTIAVYDLGGGTFDISIIEIDEVDGEKTFEV
LATNGDTHLGGEDFDSRLINYLVEEFKKDQGIDLRNDPLAMQRLKEAAEKAKIELSSA
QQTDVNLPYITADATGPKHMNIKVTRAKLESLVEDLVNRSIEPLKVALQDAGLSVSDI
DDVILVGGQTRMPMVQKKVAEFFGKEPRKDVNPDEAVAIGAAVQGGVLTGDVKDVLLL
DVTPLSLGIETMGGVMTTLIAKNTTIPTKHSQVFSTAEDNQSAVTIHVLQGERKRAAD
NKSLGQFNLDGINPAPRGMPQIEVTFDIDADGILHVSAKDKNSGKEQKITIKASSGLN
EDEIQKMVRDAEANAEADRKFEELVQTRNQGDHLLHSTRKQVEEAGDKLPADDKTAIE
SALTALETALKGEDKAAIEAKMQELAQVSQKLMEIAQQQHAQQQTAGADASANNAKDD
DVVDAEFEEVKDKK"
BASE COUNT 543 a 475 c 505 g 394 t
ORIGIN
1 atgggtaaaa taattggtat cgacctgggt actaccaact cttgtgtagc gattatggat
61 ggcaccactc ctcgcgtgct ggagaacgcc gaaggcgatc gcaccacgcc ttctatcatt
121 gcctataccc aggatggtga aactctagtt ggtcagccgg ctaaacgtca ggcagtgacg
181 aacccgcaaa acactctgtt tgcgattaaa cgcctgattg gtcgccgctt ccaggacgaa
241 gaagtacagc gtgatgtttc catcatgccg ttcaaaatta ttgctgctga taacggcgac
301 gcatgggtcg aagttaaagg ccagaaaatg gcaccgccgc agatttctgc tgaagtgctg
361 aaaaaaatga agaaaaccgc tgaagattac ctgggtgaac cggtaactga agctgttatc
421 accgtaccgg catactttaa cgatgctcag cgtcaggcaa ccaaagacgc aggccgtatc

APPENDIX 2 Retrieving files by anonoymous ftp

```
anu> > ftp huh.harvard.edu          (connecting over Internet)
Connected to huh.harvard.edu.
220 huh FTP server (SunOS 4.1) ready.
Name (huh.harvard.edu:david): anonymous
331 Guest login ok, send ident as password.
Password:  David.Green@anu.edu.au  (...normally invisible)
230 Guest login ok, access restrictions apply.
ftp> cd /pub                        (move to public directory)
250 CWD command successful.
ftp> ls taxacom*.*                  (list taxacom help files)
200 PORT command successful.
150 ASCII data connection for /bin/ls (0 bytes).
taxacom.ftp
taxacom.txt
taxacom2.txt
226 ASCII Transfer complete.
remote: taxacom*.*
40 bytes received in 0.0044 seconds (8.8 Kbytes/s)
ftp> get taxacom2.txt               (copy file to my system)
200 PORT command successful.
150 ASCII data connection for taxacom2.txt (9323 bytes).
226 ASCII Transfer complete.
local: taxacom2.txt remote: taxacom2.txt
9525 bytes received in 8 seconds (1.2 Kbytes/s)
ftp> quit                           (finish session)
221 Goodbye.
anu> >
```

APPENDIX 3 Example of a network search using ARCHIE

```
anu> >  telnet archie.au          (Use Telnet to access Archie)
Trying 139.130.4.6 ...
Connected to archie.au.
Escape character is '~]'.

SunOS UNIX (plaza.aarnet.EDU.AU)

login: archie              (login protocol is to name archie)

NOTE: THIS IS VERSION 2.1 OF ARCHIE

IT IS RUNNING ON ARCHIE.AU (sometimes known as plaza.aarnet.EDU.AU)

archie> prog world-map     (Find sites holding CIA's World Map)
# matches / % database searched:    2 /-68%
Host metro.ucc.su.oz.au  (129.78.64.2)
Last updated 04:07 30 Jul 1992
   Location: /pub
     DIRECTORY rwxr-xr-x       512  May  6 10:48   world-map

Host derro.ucc.su.oz.au  (129.78.64.5)
Last updated 00:44 29 Jul 1992
   Location: /pub
     DIRECTORY rwxr-xr-x       512  May  6 20:48   world-map

(This truncated search found the 2 sites listed above)

archie> help   (ask for help about Archie commands)
  ..... etc
archie> quit           (Finish session)
anu> >
```

APPENDIX 4 Example of a session using GOPHER

This example shows a typical Gopher session (from Australian National University) involving simple data search and retrieval of biological data from Indiana University's experimental molecular biology archive. The Gopher software is all freely available on Internet.

MENU # 1 (ANU root menu)

Internet Gopher Information Client v0.9

Root Directory

1. >>>Warning: Under Construction<<<.
2. >Editorial Statement<.
3. ANU Campus Administrative Information/
4. ANU Computer Services/
5. ANU Databases & Information Servers/
6. ANU Library Services/
7. ANU News & Announcements/
8. Australian Services/
9. Canberra Libraries/
10. Documentation & Software/
11. Other Libraries/

--> 12. Other Sites/

13. Phone & Email information/
14. The Electronic Library/

MENU # 2

Internet Gopher Information Client v0.9

North America

1. Appalachian State University (experimental gopher)/ 2. CICNET gopher server (under construction)/
3. CONCERT Network -- Research Triangle Park, NC, USA/ 4. Carnegie Mellon University AC&M Gopher (Experimental)/
5. Columbia University Experimental Gopher/
6. Cornell Information Techologies Gopher (experimental)/
7. Cornell Law School (experimental)/
8. Georgia Tech Gopher (experimental)/
9. Gettysburg College/
10. Glassboro State College/

--> 11. IUBio Biology Archive, Indiana University (experimental)/

12. Info Mac Archives (sumex-aim)/
13. Institute for the Learning Sciences (Northwestern University)/
14. John Hopkins University-- History of Science and Medicine/

.... etc

MENU # 3 (Menu retrieved from IUBio Biology Archive)

Internet Gopher Information Client v0.9

IUBio Biology Archive, Indiana University
(experimental)

1. About IUBio Gopher.
2. Biocomputing Help/
3. Drosophila/
--> 4. Genbank Sequences/
5. IUBio Software+Data/
6. Molecular Biology/
7. Network News/
.... etc

MENU # 4

Internet Gopher Information Client v0.9

Genbank Sequences

1. About.
2. Combined Genbank + Updates search <?>
3. Fetch by accession no. <?>
--> 4. Search (keyword,species...) <?>
5. Updates readme.
6. Updates search <?>
7. release brief .
8. release document.

Index word(s) to search for: Drosophila

MENU # 5

Internet Gopher Information Client v0.9

Search (keyword,species...): Drosophila

--> 1. K01298 E.coli dnaK gene encoding the heat shock 70 protein..
2. X52884 A.mellifera cytoplasmic elongation factor 1-alpha (EF-1-.
3. X52885 A.mellifera cytoplasmic elongation factor 1-alpha (EF-1-.
4. M29488 Bee homeobox-containing gene, partial cds, clone H55..
5. M29489 Bee homeobox-containing gene, partial cds, clone E60..
6. M29490 Bee homeobox-containing gene, partial cds, clone E30..
.... etc

The requested sequence is then retrieved over the network and displayed the user's screen and can be saved by the user. The entry selected here is shown in APPENDIX 1.

5.10 EPIDEMIOLOGY

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Interest in biodiversity is a basic organismal requirement for survival and it would seem that man's attitude to this has completed a full circle. Indigenous people throughout the world, often erroneously termed as primitive, are well aware of the importance of the fauna and flora that surrounds them and have learned to live in harmony with it. As society evolved, however, there was a gradual decrease of interest in the environment except for scientists who were curious about the diversity which they observed around them, such as Linnaeus and others before and after him. We must be grateful to these pioneers who, although doing little more than cataloguing what they found, laid the basis to the databases that have enabled us to judge what is happening to our environment. We are now becoming aware again of the importance of each and every species in the biological chain and from a very anthropomorphic view point are once again aware that our survival depends on maintaining this diversity.

I have worked on the epidemiology of certain parasitic diseases in the Amazon region for the past 27 years and before that in Central America and the back-cloth of such studies is biodiversity. The problem was and still is how to quantify this diversity and were to obtain the pertinent information which relates to your own situation. This is obviously where electronic communication can help. Diseases of both animals and man can be affected by subtle ecological changes which can result in the establishment of a endemic or epidemic situation. We are presently seeing this in the Amazon region where there is a change in the incidences of the different Leishmania parasites as specific vectors either flourish or die out because of habitat changes.

There have been many extremely useful contributions from those whose primary interest is either networking or database management, but few from those like myself who wish to use information at the field level. The field worker has two basic problems:-

1) Recording data in a form that can be used by others
2) Consulting relevant databases

DATA RECORDING

CODATA standards which have been prepared with such great care would seem to me a guide that could be followed and used as a standard for other groups. What database system to use also seems to be another problem and it will be interesting to see if the workshop comes to any consensus on this, or whether they decide on a NETWORK vote, which might be more democratic and give a better idea of what people are using. Because of inadequate data recording we unfortunately loose an enormous amount of hard earnt information.

As a new comer to the field of NETWORKS I am overwhelmed by the number of databases and networks that are around and find it difficult to keep track of even their names let alone what they do!

With the above in mind could thought be given by the participants of the workshop, who are intimately involved with database management, to the preparation of a guide, possibly in the form of a data base which can be asked questions and includes such information as how they can be consulted, key E-mail addresses and what costs are involved. If available it could be

downloaded or requested on a disk by those interested. Perhaps one exists! Such an exercise would seem to me fundamental in trying to find your way around.

ECOLOGICAL MONITORING

A most difficult problem that seems, at least in the Amazon region, to be presently in the hands of satellites. This is a beginning and a tremendous advance, but is perhaps merely a starting point for more detailed ground level studies. In terms of human diseases ecological changes are extremely important, but they are often very difficult to measure. In this respect I would like to draw attention to the use of key indicator species, which may vary according to the habitat of interest. For instance in the Amazonian forests certain Phychodid flies of the Phlebotiminae family are very sensitive to ecological changes and the total fauna varies according to the forest type and season.

Key species are well known in such fields as marine biology for determining plankton variations and a list by different specialists of species or groups that are useful indicators in different ecological situations would be very handy.

On the same subject a database of ecological regions by geographical area would be useful. Does one exist? I believe that the Brazilian Government has just established guidelines for more than 100 different ecological areas in Amazonia.

CONCLUSION

Organisms themselves are very well organized data NETWORKS and the bigger the animal the more complex the system. We can perhaps learn from these biological networks as to how data can be exchanged, remembering that adaptability is the secret of survival I would like to make a plea that systems and their integration should remain as flexible as possible otherwise NETWORKS may end up like the dinosaurs who where extremely big, but so specialized that they died because they could not adapt to new situations!

Micah Krichevsky's timely contribution draws attention to the sheer complexity of a biodiversity network, but I support his conclusion that cost containment and availability to less developed countries must be a prime consideration of the NETWORK for it to be a useful tool.

5.11 NC: NHP & CDC NETWORK
NATURAL HERITAGE PROGRAM & CONSERVATION DATA CENTER NETWORK

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A natural heritage program is an ongoing, computer-assisted ecological inventory operated in cooperation with an arm of state government. Each program exists to clearly identify significant natural 'elements' (rare and endangered species and communities of species) and to help establish protection priorities. All told, these programs cover 50 states and form the Natural Heritage Network, a centralized repository of information about threatened species and their habitat.

Description

Introduced by the Nature Conservancy in 1974, the heritage concept is described by its originator, Dr. Robert E. Jenkins, Vice President for Science Programs, as a permanent and dynamic atlas and data bank on the existence, characteristics, numbers, condition, status, location and distribution of element occurrences of natural biological and ecological diversity.

A typical heritage program is established under a contractual agreement between The Nature Conservancy and an arm of state government. Initial funding is often provided by private sources (foundations, corporations, and individual donors) and/or by state and federal grants.

In the absence of a contractual agreement, a proto-heritage program may be established by The Nature Conservancy. Such prototype programs generally lead to the establishment of a formal State Natural Heritage Inventory Program.

Methodology

Information about the status and distribution of a rare or endangered species, natural communities and other special ecological features in the state is collected and stored in a centralized data management system. Map, manual and computer files keep the information organized and easily accessible. Records are indexed by several criteria, including standardized name, location, endangerment status, watershed, and land ownership. All heritage program database inventories employ standardized methods and identical terminology process information about a state's natural elements. '

Inventory Characteristics

It is 'element' oriented.

The inventory focuses on individual components or elements of state's natural diversity. These include distinct biotic communities, special plant and animal species, and other natural features that are rare and endangered at the state or national level. Critical elements are identified and compared to ensure to ensure that conservation efforts focus on the most threatened.

It is a centralized repository Information previously scattered among state and federal agencies, county conservation programs, academic institutions, private conservation groups, individual citizens, and in published and unpublished reports is gathered into a single database. By consolidating existing sources, the inventory serves as a clearinghouse for ecological information in the state.

It is ongoing.

The inventory is a cumulative process through which information is continuously updated and refined. Old records are checked in the field; new areas are surveyed; known 'element occurrences' are monitored, and changes in land conservation status are recorded. As a result, the assessment of the state's ecological resources is current and increasingly accurate.

Inventory Applications

Land Protection: Limited conservation dollars and volunteer contributions must be allocated carefully. Information from the inventory helps focus attention on a state's most critically threatened natural features. Landowner and land managers may also be informed of the presence and importance of critical species so that they can voluntarily help protect them.

Environmental Impact Assessment: Before the heritage system was established, land-use decisions were often made without sufficient information. As a result, many biological resources have been destroyed inadvertently. A professionally staffed, centralized data base is readily accessible to facilitate informed decision-making before costly planning investments are made.

Resource Management: Wise stewardship of a state's natural areas requires knowledge of sensitive or endangered biological features. Information maintained on parks, preserves, wildlife areas, and private conservation areas may be used to improve existing management policies and practices.

Endangered Species Review: Information collected and analyzed be the inventory is helpful in the revision of state and federal lists of endangered species.

Research and Education: As the heritage database matures, gaps in our current knowledge have become evident. Results from the inventory guide new research, and the data base itself provides a long-term educational resource.

Results

Fifty states are now covered by the Natural Heritage Inventory Network. In addition, The Conservancy has set up heritage programs outside the U.S., where they are called Conservation Data Centers. CDCs are presently established in three Canadian provinces, and thirteen Latin American and Caribbean countries, with current plans to expand the network beyond the Western Hemisphere.

5.12 INTERNATIONAL COUNCIL FOR BIRD PRESERVATION

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**(Note by the editors:
Please see also Chapter 6.35 on page 257 for an updated version.)**

ICBP is a partnership of organisations which use birds as a spearhead for concern and action over biodiversity conservation and its contribution to humanity. It works on research, practical conservation and network development throughout much of the world.

ICBP believes in the value of collaboration and wishes to develop its contribution in efficient partnership with like-minded organisations. It especially wants to develop greater indigenous strengths and will in 1993 launch a new federal structure to further this.

ICBP makes its distinctive contribution in three areas:-

1) Development of global biodiversity conservation priorities. ICBP's contribution - Putting Biodiversity on the Map: Priority Areas for Global Conservation (1992) - is the first global analysis of distributional data on any extensive group of animals. Because birds are well known and well supported, collection of further data and development of analyses can make a particularly practical and effective contribution to evaluating the effectiveness of conservation actions and monitoring sustainability of environmental use.

2) Development of national NGOs. NGOs have a vital role to play in moving the natural inertia of governments and the uptake of the biodiversity convention will be much influenced by NGO support. As shown by the strength of organisations in various countries (such as RSPB in Britain), birds are the most successful wildlife group to focus the motivation of popular interest in wildlife and conservation. ICBP has been particularly successful in strengthening and uniting organisations in Europe as an effective lobby for conservation especially through Important Bird Areas in Europe (1989) and further work in progress. We can use a proven model of network development to assist with the same challenge elsewhere in the world.

3) Development of practical conservation programme work. ICBP believes that the development of research and of networks is most effective in the hands of organisations with a practical programme. In this way, there is less risk of research contributions lacking practical application. ICBP will therefore seek to base the development of national NGO strengths on organisations with both scientific and practical conservation programmes. Through the federation, programme skills can be developed and exchanged starting from the basis of practical experience from completed projects.

ICBP has extensive data-bases but data flows are still largely by means of written and printed material. The bird world is very rich in unpublished knowledge and grey literature. ICBP would be keen to join a global effort to improve biodiversity conservation through better use of knowledge and believes that birds have a valuable contribution to make.

5.13 PROPOSAL FOR SPONSORSHIP OF THE INTERNATIONAL CONSERVATION SOFTWARE (ICONS) PROJECT

Preston D. Hardison and William Harp

March 10, 1992

Introduction

The global transformation of the environment is occurring at unprecedented scales and rates. The number of changes in policies, institutions, values, and individual decision-making required to respond to global change is staggering (Bormann and Kellert, 1991; Chechile and Carlisle, 1991; Costanza, 1991; Daly and Cobb, 1989; Goodland, 1990; Leonard, 1989; Ostrom, 1990; Silver and DeFries, 1990; Turner, et al., 1991; WCED, 1987; Wilson, 1988).

The scope of global change requires changing the way that information is collected and made available to those seeking to understand and meliorate the processes degrading environments and human welfare (Keystone Center, 1991; Lubchenco, et al., 1991; Mathews and Tunstall, 1991; Stern, Young and Druckman, 1992; WRI, IUCN and UNEP, 1992). We especially need to extend the degree of collaboration, institution development and information sharing between the developed and developing world (Raven, 1990).

ICONS, an electronic relational database system, is designed to support general conservation information needs, particularly in developing countries. The two goals of the project are:

1. To create an inexpensive, non-profit computer software system for providing text-based information to the conservation community.

ICONS will store, code, and search high quality text related to the social and natural sciences. It will be easily used by unsophisticated computer users with modest computer resources, and will be distributed on a non-profit basis. The software system will be self-contained, with sufficient resources to create and use databases, and to write simple reports without having to resort to expensive commercial software. However, ICONS will take advantage of more sophisticated software if it is available.

2. To use this software system to build a public access, public domain conservation database distributed as cheaply as possible. The ICONS database will be translated into multiple languages and distributed at cost or near cost, subsidized by institutional support and/or software sales graded on ability to pay. Though users can use the software to build private databases, they will be encouraged to submit information in the public domain to a centralized clearinghouse. The clearinghouse will also attempt to secure rights to distribute copyrighted material in electronic form. The information in the public domain database can be copied and used without restriction, or with appropriate use and citation restrictions. In this we hope to encourage groups and individuals to write high quality and locally appropriate educational materials based on the database, and aid researchers to find and use existing information and databases.

The ICONS Software and Database System

ICONS and the ICONS database are being developed for non-profit distribution to conservation, education, and scientific groups and individuals. We are targeting developing countries, that have poor access to libraries, electronic networks, or commercial databases.

ICONS currently has eight modules:

1. Geographic Areas: Contains information on parks, reserves, forests, management areas, etc., with fields describing size, soils, climate, water bodies, latitude and longitude, minimum and maximum altitudes, international and national status (if available), habitats, land uses, and management agencies.

2. Bibliographic References: Contains textual information on books, monographs, theses, journals, audio-visual materials, and "grey" literature. The module can store abstracts and full text for articles, and we are working to implement graphics storage. Allows for abstracts, full text and commentaries.

3. Organizations and their Staff: Contains information on government and private collectives, agencies, and institutions, with a breakdown for staff members, their specialties, and biographical information (dossiers).

4. Individuals: Contains information on individuals and their public affiliations, or independent researchers and activists. Allows organizations to maintain member lists.5. Legislation: Contains information on national and international laws, statutes, cases and legal conventions, allowing for summaries, commentaries, and full text.

6. Projects, Events, and their Participants: Contains information on project goals and achievements, funding, management and implementation, participants, etc. Information on events and their organizers.

7. Cultural Groups and Specific Populations: Contains general information on groups, with a breakdown for specific populations. Fields for subsistence patterns, group size, habitats of cultural residence, administrative organizations, and legal status. Allows for long-text descriptions of both the culture as a whole and individual populations.

8. Species and Species Populations: Contains general information on species characteristics, with a breakdown for particular populations. A Linnean profile using the major categories is available for each species. Allows for long-text descriptions of both the species as a whole and details on individual populations.

In addition to the main modules, the software also contains look- up databases (see Figure 1b: p. 4). These databases contain codes used in the modules and their descriptions, and can be seen as a pop-up screen when the user is in any one of the modules:

A. Countries: Fields for the country name, acronym, capital, and user-definable codes. A text field allows descriptions of unlimited length for building country profiles.

B. Dictionary: Fields for words or short phrases, short definitions, and user-definable codes.

C. Habitats: Fields for habitat type, a short description, and user-definable codes.

D. CITES: CITES I, II or II classifications, with a short description, and user-definable codes.

E. IUCN: IUCN codes I - X, with a short description of each, and user-definable codes.

F. Taxonomy: Kingdom, Phylum, Order, Family, and Subfamily, each with a long description characterizing the taxonomic level, and a list of those major levels above it in the hierarchy. User- definable codes allow coding by specialists of the minor taxonomic levels (suborders, subgenera, etc.).

G. Look-Up Tables Under Development: the Holdridge Life Zone System, the Koppen System, Land Use Systems, the Comprehensive Soil Classification System (USDA/FAO), and Udvardy Biogeographical System. Other look-up tables can be developed in consultation with experts.

H. Reports: Will contain standard reports for each of the modules, and allow users to generate customized reports.

I. Utilities: Will include ascii text importing and exporting, report and mailing label printing, file management, and a text editor. Not implemented at this time.

J. Keywords: This is the most important aspect of the database system. Rather than split the database into a large number of fields, ICONS uses keywords fields to code information contained in text files. Users are able to view a list of topical codes that are common to all modules and submodules. In addition, each entry can be coded using acronyms assigned to geographic areas, projects, species, cultural groups, bibliographic references, laws, and organizations. The simple to use, multiple keyword system can cross-reference all of the data records throughout the system and thematically tie disparate types of information together from separate modules.

There will also be utilities for generating reports using the module fields, and editing, importing and exporting text. ICONS contains a password system for private access to database files. Versions can be constructed allowing for read-only capability, and password mediated entry rights. Commands may be selected from a menu bar by novice users, or by using keyboard entries. Many fields are validated against allowed entries from look-up modules, reducing potential errors.

ICONS can manage over half a million records, and will run on local area networks, allowing hundreds of users to use the database simultaneously. It can be run as a local computer Bulletin Board System (BBS), allowing local database access by modem. Future versions are expected to be able to be run on UNIX mainframes for use at universities. We are developing the capacity to import and export ascii text, and users will be able to use scanners and optical-reading software to read, convert and store text. Translation software will allow rapid and inexpensive development of multiple-language versions of the database.

Mass storage devices make information-rich archives attractive, even for developing countries. CD-ROM technology, for example, is capable of storing approximately 300,000 pages of text, and disks can potentially be sold at $35-75 per disc (OTA, 1988). Even medium-density diskettes (costing approximately 75 cents to copy and mail) can store several thousand pages of information.

Conclusions

ICONS enters a niche occupied by few other database systems. Some software, like UNESCO's Micro-ISIS, is freely distributed, but difficult to use, limited in scope, and do not allow users to easily share databases. Some databases are public access, but require expensive commercial software to read. Other database systems distribute both databases and their own software, but are prohibitively expensive to most organizations, especially in the developing world.

The ICONS software is easy to use, and powerful enough to permit the development of a variety of databases that can serve both professionals and citizens. Built on a model of cooperative computing, we believe the software can be used to exchange high quality information for a minimum price.

We also believe that the time has come for the development and promotion of more publicly accessable databases. There is a growing worldwide movement for increased citizen scrutiny and participation in development decisions, based upon the public's right-to-know and right-to-inform about development alternatives (Chambers, et al., 1989; Shrader-Frechette, 1991; Stern, Young, and Druckman, 1992; WCED, 1987; West and Brechin, 1991). We believe that the broad spectrum of information encoded and managed by the ICONS software can contribute to organizing the dialogue concerning the protection of biodiversity in the face of human needs and aspirations.

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Appendix A

Issues for the Future: Institutionalization of ICONS

It is our intention to use the software to create an international, public access database, to which others would be invited to contribute. We are willing to explore our several options with other patrons if there is an interest on their part. ICONS must become institutionalized with a directorate, so that coordination of data collection and integrity is possible. Three immediate possibilities are:

1. That a patron or consortium of patrons agree(s) to house the project. Advantages: Access to patron expertise and resources, lower costs from using an existing infrastructure. Disadvantages: Potential problems with data ownership and getting other NGOs, agencies and individuals to contribute to the public access database.

2. The project will be housed at a neutral existing organization or institution. Advantages: greater neutrality, access to student labor and propinquity to scholarly information and expertise. Disadvantages: Possibly high institutional overhead costs.

3. Set up an independent, non-profit organization to administer ICONS, to be overseen by an external advisory board. Advantages: Autonomy and neutrality in database acquisition and distribution. Disadvantages: Increased initial costs and the potential decrease of available expert advice and information.

We wish to design the institutionalization of the project to meet the following goals:

1. Minimize the cost of data entry2. Minimize the cost of the software and database3. Distribute the database in a non- proprietary way4. Create an easy to use system6. Encourage user contributions to the database7. Maintain the quality of the information in the database8. Regularly update the software, data archives and current data to meet changing needs

Data Entry

At the first level, data will be entered by ICONS staff, with the cost partly dependent on the form of institutionalization.

The second level of data will come from organized networks trained in the use of ICONS. Options include establishing new networks, establishing agreements for data exchange with existing professional networks (see Appendix C), and agreements with student (e.g.: student chapters of the Society for Conservation Biology) and grassroots organizations. Students, for example, can learn about conservation, and how to manage databases and use electronic networks. They can be hired at student rates, or work for academic credit, or volunteer, defraying the costs of data management considerably. Problems in data reliability can be overcome by keeping the number of nodes small, with strong training programs and oversight by node operators.

The third level of information will come from independent users of the ICONS software. These data will be handled by the ICONS staff, which will attempt to verify and code them. Problematic data will be subject to user and external advisor comment. Unresolved problems with the data will result in deletion of the data. Since ICONS will be intermediate to more specialized technical and management-oriented databases, it will not attempt to clean up every discrepancy. This is better accomplished by sectorial interests with professional staff.

Data Distribution

1. The centralized clearinghouse will sell the database on different storage media at near cost. Databases of different sizes can be prepared to meet specific needs. Regional information, for example, can be distributed on diskettes, while larger archives could be stored on tape or CD-ROM disks.

2. Allow local distribution of the database. Electronic bulletin board systems (BBSs) allow users to access the database locally by modem, and download those portions they need. Well endowed users (such as libraries, larger NGOs) can purchase the entire database and let other users copy portions and create small working databases on modest computer systems.

3. Develop versions of the software and database for use on multiple computer platforms, including UNIX minicomputers and Macintosh systems.

4. Encourage users to create printed materials based on the database, and to distribute them to people without computer access.

Appendix B

Advantages of the ICONS Software and Database System

Distributed and cooperative public database systems have many advantages. By allowing users to read a database, add new entries, and to generate reports that can be printed or exported to other computer software programs, ICONS can:

1. Aid in collecting the widely dispersed and local "grey" literature (e.g.: newsletters, internal reports, publications by small laboratories), and local knowledge and perspectives on resource and development decisions.

2. Decrease the cost of data acquisition by allowing users to subsidize the cost of data entry and capitalizing on the economy of scale for mass storage on disks or CD-ROM to distribute more information for less cost than paper-based distribution.

3. Help increase data validity and reliability by being able to collect comments from a large number of expert users in a single place, thereby focusing debates and clarifying issues.

4. Take advantage of local electronic networks and disks for inexpensive database distribution. This is particularly important where modem access is costly or absent, as occurs in most of the developing world.

5. Increase the speed and efficiency of coding, locating, and compiling information over electronic bulletin board systems which are time-consuming, and often costly, to search.

6. Distribute information to sectors often ignored by current database systems, particularly students, grassroots groups, and researchers in the developing world. Most current software and databases have the following characteristics which exclude potential users (Backus, Olivieri, and Mann, 1990; Grainger, 1990; King, Gray, and Gibbon, 1990; Stern, Young, and Druckman, 1992):

A. Proprietary (e.g.: The Nature Conservancy's Conservation Data Centers).
B. Expensive (e.g.: The Human Resource Area Files; GEMS data; OECD data).
C. Distributed at one or a few locations, limiting outside access (e.g.: UNEP GEMS; The Nature Conservancy's Conservation Data Centers).
D. Have a narrow focus (e.g.: NMNH Latin American Plants Project).
E. Difficult to use and aimed at the professional environmentalist (e.g.: The Nature Conservancy's Conservation Data Centers).

7. Promote sharing information on important topics of common concern, reduce costly duplication of effort, and increase access by concentrating information in a single inexpensive relational database system. With a large number of users supplying current information, the system can be quickly updated. As an archive, the system can provide background and context for more informed evaluation and action.

Appendix C

Databases and Information Distribution Systems with Similar Aims to ICONS (very short list)

1. The American Ornithological Union operates the Library Enhancement Project, aimed at getting textbooks, back scientific journal issues and current subscriptions to Latin American countries (Mercedes Foster, pers. comm.).

2. The Special Program for the Improvement and Development of Ecological Research (SPIDER) in Argentina is developing information systems for tracking environmental technologies and resources (DABSTER) and direscotry of human resources and natural reserves (LADDER).

3. The Developmental Strategies for Fragile Lands (DESFIL) Project funded through US AID has developed the Natural Resource Management Support Project (NRMS) data base system for tracking resource projects.

4. The Tropenbos Foundation in The Netherlands has compiled a partial list of databases with information related to tropical forests, and is developing a database for land inventory and forest evaluation.

5. The Center for Indigenous Knowledge and Resource Development (CIKARD) indexed database of indigenous resource uses and practices.

6. The Missouri Botanical Gardens TROPICOS database system of over 500,000 botanical accessions.

7. The International Center for Living Aquatic Resources Management (ICLARM) distributes FISHBASE, a low-cost data library on the habitats, population structure, reproductive characteristics, aquaculture and diseases of 2000+ commercially important marine organisms.

8. The IUCN Programa de Humedales distributes directories of publications related to wetlands in Latin America, and mails copies of research reports for a small fee to organizations and individuals that request them.

9. CATIE distributes information on the Tropical Forest Action Plans for Central America through Servicio de Informacion y Documentacion Forestal para America Central (INFORAT).

10. The Human Relations Area Files (HRAF), published by Yale University, contains an extensive collection on world cultures. However, its cost (over $5,000, plus an annual update fee of over $1,200) limits its distribution to larger libraries.

11. The International Species Identification System (ISIS) for record-keeping on captive animals in zoological gardens, operates in the manner proposed by ICONS. Costs are supported by external grants and subscription prices based on zoo gates. Zoos subsidizing data entry and maintenance.

12. The Latin American Plants Project at the National Museum of Natural History, is preparing a plant distribution database in cooperation with Latin American institutions.

Appendix D

Organizations Interested in Cooperating with the ICONS Project:

Preston Hardison has spent some time showing a demonstration version of the program to several organizations which have expressed interest in working with ICONS, some of which are:

Fundacion Natura, Colombia: He talked with Andres Rubio Torgler (Information Specialist) and Claudia Romero (Scientific Advisor and head of Parks in Peril for Colombia).

Ambiodata, Colombia: A consortium of Fundacion Natura, Fundacion Pro-Sierra de Santa Marta, and Fundacion Puerto Rastrojo.

Red de Formacion Ambiental (REDFORAM), Instituto Colombiano para el Fomento de la Educacion Superior (ICFES), Colombia: Sra. Ana Lucia Narvaez, director of the Colombian Environmental Network, is interested in integrating the system in the national network. REDFORAM administers the program in Environmental Education and Forestry Education under TFAP funds. They are seeking to establish a national center involving over 200 universities and environmental NGOs. If ICONS is developed, they are willing to sign a convention for supporting of in-country publication and distribution costs for materials in

Spanish, data acquisition, and database distribution. They are also willing to sponser a seminar with the REDFORAM member groups in the use of ICONS. They are working with the Sistema de Informacion y Doumentacion para la Educacion Superior to establish public access data bases in many of the areas targeted by ICONS, and are willing to share these data with the ICONS Project.

Instituto de Educacion Ambiental (IDEA), Universidad Nacional, Bogota, Colombia: He talked with Augusto Angel Maya, who has OAS funds for augmenting information exchange networks.

Secretaria Ejecutiva del Convenio Andres Bello (SECAB), Colombia: Eloisa Trellez (director of Proyecto Medio Ambiente y Desarrollo Social: MADS) says MADS would be willing to support some in- country costs for the distribution, use and management of the ICONS system. They have published a volume on Environmental Legislation in the Andres Bello Convention Countries, and various volumes on environmental education.

Appendix E

Technical Description and Tools Used to Create Icons

The ICONS database management program was created in Clipper 5.01, and xbase compatible language. The ICONS program exploits many of the Clipper compiler features, including multi-user code, user-defined functions, multi-dimensional array technology, user-definable help, manipulation of the object classes, and highly modular programming techniques that facilitate quick changes.

Much of the database maintenance portion of the program was created with the Genifer template language, and most of the reporting system was created with the R&R code generator. The system documentation will be typeset with Ventura and published on a Postscript printer.

The ICONS systems will run on any IBM-PC MS-DOS compatible system, providing there is enough diskspace for the program and databases. The system will support both monochrome and color monitors. Because the Clipper Linker RTLINK supports virtual memory management, ICONS will run in almost any memory space, but will take advantage of additional memory if available. ICONS performs best on a 386 16mhz processor or better machine with at least two megabytes of memory, a large fast hard disk and disk cache system. ICONS has been prepared for a multi-user environment and will run on any net-bios compatible network operating system, including Novell netware, Banyan Vines and the Lantastic peer-peer network operating system.

Appendix F

Biography of the ICONS Project Members

Preston D. HardisonDepartment of Psychology NI-25University of WashingtonSeattle, Washington 98195Tel: (206) 527-0119

Preston Hardison is a doctoral candidate in the Department of Psychology at the University of Washington. His undergraduate degree is from the University of Texas at Austin, where he worked with Del Thiessen. His dissertation is on the Social and Environmental Economics of Sex Allocation in the Androdioecious Coral Reef Fish, Serranus baldwini, in San Blas,

Panama. He has studied the siociobiology of black-tailed prarie, Cynomys ludovicianus, dogs with John Hoogland, the neurobiology of learning in the terrestrial slug, Limax maximus, with Alan Gelperin and Chris Sahley, and the development of offspring- parent and parent-offspring recognition in colonial swallows with Mike Beecher. He has worked on a WWF-US project with Dr. Sam Wasser in the Uzungwa Mountains, Tanzania. His interest in international conservation, and the crucial need for delivering and acquiring better scientific and political information to local, grassroots organizations stems from his research experiences.

H. William Harp Darien Information Systems, Inc.Apartado 1215Balboa, AnconRepublica de PanamaTel: (507) 64-6018

William Harp is a doctoral candidate in the Department of Anthropology at the University of Oregon. He is currently writing his dissertation, entitled Cosmology, Shamanism and Ecology Among the Choc=97-Ember=87 of Eastern Panama. He is technical advisor to the Fundacion Darien, a grass-roots indigenous organization that supports issues of interest to the indians of the Darien region. His companies, Cultural Resources International, S.A. and Darien Information Systems, Inc., S.A. provide consulting services in the social sciences and micro-computer technology. He has written over 30 major custom microcomputer systems, and is a contract programmer/analyst and trainer to several U.S. government agencies operating in the Republic of Panama. He is currently system designer and programmer for Steve Hubbell at the Forest Dynamics Project in the Center for Tropical Science at the Smithsonian Research Institute in Panama.

Stephen Ernst Gandolph Computing7619 175th Street SWEdmonds, Washington 98020 Tel: (206) 774-7516

Stephen Ernst has been working with computers for over 20 years. At the University of Washington in 1972, he designed and implemented a database management system, first for the Harborview Community Mental Health Center and then later for the Child Development Mental Retardation Center. In 1981 he launched Quickpen International with Curtis Broughten, a company specializing in construction estimating software. As Vice- President of Software and Development, Steve was responsible for the design and implementation of the company's software products, with a particular emphasis on the custom database that formed the heart of the estimating system. During Steve's tenure, the company grew to become a $10 million a year enterprise and the programming staff grew from an initial team to a department of 15. The company's success was due in large part to the reputation it earned for producing a tool for computer naive contractors that was easy to learn and use. The Quickpen estimating system is currently being used by 23 of the top 25 mechanical contractors in the United States, and the software has been licensed for distribution in Europe and Japan. Steve currently focuses on consulting, focusing on the design of the computer/human interface. For the past two years, he has specialized in the Microsoft Windows environment.

5.14 THE INBIO/INTERGRAPH COLLABORATION INFORMATION SHEET

Intergraph Contacts:

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13 JULY 1992

Intergraph Corporation of Huntsville, Alabama, USA, and INBio (Instituto Nacional de Biodiversidad) of Santo Domingo de Heredia, Costa Rica, have agreed to collaboratively develop a computerized Biodiversity Information Management System (BIMS) for INBio. Intergraph comes to the relationship as a world leader in interactive computer graphics, strategic mapping information systems, and a supplier of integrated technical information management systems to Fortune 500 companies. INBio is a world pilot project in the conservation of tropical wildlands through discovery and use by Costa Ricans and the world. Should commercially marketable software be developed as a result of this relationship, INBio and Intergraph will share the income from sales of the software.

Intergraph is contributing approximately three-quarters of a million dollars in hardware, software, and services, beginning June 1992. These include customization and installation of the system by experienced Systems Integration teams from Intergraph, training of 2 INBio personnel, and software upgrades and hardware maintenance over an 18 month period. These personnel will handle day to day maintenance of the system and modify its function in accord with the needs of INBio users. INBio is contributing vision and experience in industrial-scale techniques of collection, management, and use of information related to the approximate half million species of Costa Rican organisms, from viruses to vertebrates. The rich complexity of Costa Rican biodiversity, equivalent to that of the US in a country the size of West Virginia, requires novel approaches at all levels.

The INBio - Intergraph system will be part of the core of INBio. This advanced computerized management of information is critical to INBio's mission of conserving Costa Rica's biodiversity through rapidly making it broadly useful, interesting, and even exciting - and therefore making it valuable to a broad cross-section of Costa Ricans without destroying it. This means collecting and manipulating information about Costa Rica's species in a goal-directed manner for a variety of intellectual and commercial users. INBio believes this is the only manner in which tropical biodiversity can be secured in a period of world emergency.

Through this system INBio will be able to manage accurately and completely a suite of large databases holding traditional text and numeric information about Costa Rican organisms and their properties such as geographical distribution, chemical characteristics, published literature, ongoing studies within Costa Rica, and whatever else is of priority. This information will be linked to graphic files including drawings, photographs, and maps of organism distribution and Conservation Areas. As a world leader in Geographic Information

Systems, or computerized mapping, Intergraph brings to the system techniques of quickly generating maps from aerial photographs and performing computer assisted analysis of physical, geographic and biological variables. The speed and complexity of these techniques greatly exceeds what can be done by manual methods. Intergraph is also providing a large amount of storage memory to support INBio applications which rely heavily on interactive graphics.

A system like this has great potential for many kinds of uses and users. In practice, however, its value depends primarily on the willingness of a broad spectrum of goal-directed users to use it. This collaboration is designed to confront this issue through the joint resources of Intergraph and INBio working closely together. The system will be painstakingly designed by a joint INBio - Intergraph team for ease of use by a broad spectrum of INBio personnel who do not have prior technical training, with projects of graduated difficulty so that goal-oriented users will grow into the power of the system without excessive frustration. In addition, there will be ample workstations available and 57 gigabytes of initial memory capacity. Experienced Intergraph personnel will advise INBio in the memory and input-time requirements of potential projects to allow users to evaluate the resource cost of a project in relation to their priorities before beginning.

The anticipated users of the system include a broad range of INBio personnel in the Directorates of Biodiversity Inventory (Botany, Entomology and others), Biodiversity Prospecting, and Biodiversity Information Dissemination, as well as collaborating national and international scientists and personnel of Costa Rican Conservation Areas. The Directorate of Information Dissemination will in turn use the output of the system to help a diverse set of Costa Ricans, including school children working on a report, government planners, and commercial entities.

This relationship is the second contract between INBio and a commercial entity. In October 1991, INBio signed a contract with Merck, Sharp and Dohme to provide biodiversity samples for screening for possible pharmaceutical activity, with INBio sharing the profits from royalties of any medicine found in this manner with Merck. In all of INBio's present and future commercial relationships, profits from commercial sales will be divided between Costa Rica's Conservation Areas and INBio's operational costs.

Intergraph Corporation, a billion dollar, Fortune 500 company with offices in over 40 countries, is the world's largest company dedicated to developing and manufacturing interactive computer graphics systems. Intergraph has spent more than 22 years developing computer graphics solutions for virtually every major industry: automotive, aerospace, defense, utilities, petroleum, manufacturing, transportation, mapping, environmental, publishing. Intergraph systems offer fully integrated solutions for a wide range of applications, providing the tools necessary to properly manage technical information.

INBio is a three-year old private non-profit institution working in close collaboration with the Costa Rican government on innovative approaches to conserve Costa Rica's biodiversity. INBio has a growing international profile, particularly from its parataxonomist program (the training of rural Costa Ricans to carry out the national biodiversity inventory) and for its collaboration with Intergraph and Merck. INBio has been widely recognized as a world pilot project by international organizations such as WRI, TNC, IUCN, UNDP, UNEP, US-AID, Swedish SIDA, the MacArthur Foundation, Pew Charitable Trust and others, and by prizes such as the St. Francis of Assisi Canticle for All Creatures. While INBio's progress has been widely admired, fund-raising remains difficult. In the long run, INBio is searching for a $50

million endowment. Tax-deductible contributions may be sent to the INBio fund, The Nature Conservancy, Latin American Programs, 1815 N. Lynn Street, Arlington, VA 22209.

5.15 QUESTIONS COMMONLY ASKED ABOUT Internet

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WHAT IS Internet?

Internet is about 10,000 information networks of all kinds, encompassing approximately 1,000,000 computers, that are linked together through common open protocols to form a vast global network of networks. It includes all kinds of diverse public and private networks, gateways, and backbones, in almost every country and region of the world: from Antarctica to Siberia, from Mongolia to Manitoba. Only the public telephone network exceeds it - in terms of extent and connectivity.

WHERE DID Internet COME FROM?

Internet is an outgrowth of a research effort on packet switching technology started by the U.S. Defense Advanced Research Projects Agency in 1968. An immediate result of this research was the creation of a network called ARPANET which eventually included packet nodes in the U.S. and sites in the UK and Norway. An extension of this effort led to packet switching experiments using mobile radio and satellite communications. The need to link these systems together led to the Internetting project, the immediate outcome of which was a research Internet to join many autonomous information networks at participating research, academic and government institutions.

In the mid-80s, the U.S. DoD separated an operational MILNET from the rest of the experimental ARPANET. In the last half of the 1980s, the National Science Foundation began work on a supercomputer network called NSFNET. When the ARPANET was retired, the NSFNET backbone, together with other agency networks (e.g. NASA and Department of Energy nets), became the principal backbone nets for the Internet in the U.S.

Beginning in the late 80's, similar major internet initiatives were begun throughout the world in dozens of countries, and connections among all these networks were established and are continuously enlarged to meet the global needs for information resource connectivity.

WHAT IS Internet's GROWTH PROFILE?

With a monthly growth rate of computers hosts averaging 10-15 percent, the Internet is by far the most rapidly growing electronic network in the world. Traffic growth on major backbones has been exceeding 25 percent per month. The growth is without precedent in the field of communications and is invoking major engineering efforts to accommodate the anticipated size, complexity, and traffic.

WHAT DOES Internet PROVIDE?

The primary applications include electronic mail, file transfer, and remote log-in. Special electronic mail architectures are also used to support news distribution applications. Major backbones presently support transfer rates from T1 (1.5 Mbit/s) to DS-3 (45 Mbit/s).

HOW EXTENSIVE IS Internet USE?

The magnitude of Internet mail and file transfers constitute by several orders, the most extensive use of these applications in the world. Domestic traffic through one major U.S. Internet backbone alone exceeded one terabyte (10 at power 12) in September 1991. "Super-exponential" traffic growth patterns are being experienced in every country and region.

WHO USES Internet? ISN'T IT JUST AN "ACADEMIC" NETWORK?

More than 5 million people worldwide in more than 100 countries who have a need to access and use information or to collaborate rapidly with colleagues use Internet - in whole or in part. Major user groups include: researchers and educators in every professional discipline, government officials and agencies, commercial enterprises. It has spawned entirely new disciplines like collaborative theory.

Internet started as an academic network, which was supported and been evolved by most of the world's best universities and institutes. It subsequently attracted commercial service providers, and today, most major electronic research, manufacturing, and operating companies are now active Internet users. It is increasingly being marketed and used for many commercial purposes.

WHO "RUNS" Internet?

No one! It exists by virtue of cooperation among all the diverse networks and users to follow certain protocols and practices, but otherwise maintain their autonomy.

The cooperation centers around an Internet Architecture Board (IAB) with an international composition, and which is the standards making body within the Internet Society. An Engineering Task Force (IETF) develops the standards, and a Research Task Force which fosters and maintains networking nd information science experiments involving internetworking, report to the Board. The IETF develops and adopts the most extensively used open internetworking standards in the world.

The Internet Society is now the world's internetworking international organization. It also hosts the annual International Networking Conference, publishes the Internet Society News magazine, and serves as a global mechanism for development, administration, and standards making for internetworking.

HOW IS Internet USAGE PRICED?

1. The transmission technology employed by internet is "connectionless" - which intrinsically results in very low transmission cost per unit of information.

2. Because of the overhead of trying to charge for connectionless traffic so greatly exceeds the transmission cost, and because all the participating network owners have placed

paramount value on the ultimate benefits of unfettered use, the Internet community has had a strong tradition of no accounting and no settlements related to traffic.

3. Most of the major backbones and networks used for transit traffic consist of very large "digital pipes" using fixed-price charging algorithms which are shared among all users. This practice will probably evolve over time to equitably accommodate increasing large commercial network implementations and users. For this purpose, a Commercial Internet eXchange (CIX) has been recently formed among commercial Internet providers.

HOW DO YOU GET CONNECTED?

You make arrangements with a nearby Internet service provider to provide access; you contact the local registration authority for an address; you provide a transport path to the access node; you obtain a transport path from the service provider with a router or host computer running the necessary Internet protocols.

If you want just personal access, you find someone that will provide you a user access account. Increasingly, commercial public access is being offered throughout the world from a wide variety of public and private providers.

IS THIS EXPENSIVE TECHNOLOGY?

Internet technology is inherently very low cost and robust. In addition, the rapid growth of Internet and internets (see below), has created such large markets for the equipment that major scales of economy have emerged to lower prices down to the mass consumption level.

Because Internet is a network of networks, it relies upon relatively little in addition to the information systems that already exist. These "additions" are the transmission paths and computers that serve as a routers and support the necessary protocols. Internet is designed so that these additions can be scaled from PCs linked over dial-up lines all the way up to high-performance special routers form major national or regional "backbones".

This has led to Internet capabilities being implemented everywhere - from the most resource poor developing countries and remote locations to major world information centers.

A major problem often faced in many countries is obtaining access to cost-based leased lines that constitute the ideal internet linking medium. However, national authorities are increasingly realizing their overall national or regional information infrastructure and development of an information skilled next-generation is critically dependent on Internet evolution and growth.

WHAT ARE Internet INITIATIVES?

The desirability (if not mandatory) nature of Internet connectivity in today's Information Society is producing major public initiatives on international, regional, and sectoral levels. One of the best know current initiatives is the Gore Bill

I which has several hundred million dollars in the U.S.A. for the National Research and Educational Network. A second bill has recently been developed that seeks to fund widespread connectivity.

Many other nations and regions like the European Community have similar albeit smaller scale initiatives. The United Nations Development Programme and many volunteer international organizations have also begun ambitious initiatives for Third World countries.

HOW IS Internet PUT TOGETHER?

The Internet is based on the use of a suite of open internetworking protocols to allow information networks, equipment, and applications of all kinds, public and proprietary, to communicate with each other. The original and most widely used suite is referred to as TCP/IP or even IP (Internet Protocol). Most workstations and minicomputers sold today come bundled with TCP/IP.

Some similar protocols have more recently been developed by other standards bodies such CCITT and ISO. However the proven, reliable characteristics of TCP/IP which are developed and evolved by users to meet real needs, as well as massive embedded base, have made them the "de facto" information networking standards of the world.

It is important to emphasize, however, that Internet supports multiple protocols from a wide variety of standards bodies as they become significantly implemented in the world's information systems.

WHAT IF YOU ARE NOT CONNECTED?

Chances are, if you are connected to any information network in the world, even if not part of Internet, there is a gateway of some kind to Internet. This allows E-Mail transfers, but with some significant penalties in the form of addressability problems, slower or less reliable mail transfers, and mail size limitations. What is really missed, however, is the ability to easily and quickly transfer files or remotely log-on to thousands of open computers resources throughout the world.

If you are not connected, you have only limited access to most of the world's available electronic information resources. More simply put by the founder of the prestigious Information Sciences Institute - if you are not connected, you "will be left standing in the dust by the information revolution."

IS IT DANGEROUS TO BE PART OF AN OPEN NETWORK?

Being connected to or importing data from any external source presents some risks. The existence of hackers, viruses, and worms are well known and give rise to legitimate concern. In general, however, these risks are minimal, controllable, and are significantly outweighed by the value of easy, open access to most information resources and people.

The Internet research and standards making communities are continuing to develop and implement new techniques designed not only for enhanced security, but for privacy as well.

IS Internet THE ULTIMATE ANSWER TO ALL INFORMATION NETWORKING?

Internet is not a panacea for all information networking needs. It is designed to provide substantial connectivity among most public and private networks - not to replace those networks or eliminate alternative access techniques such as direct public phone or packet network connections.

WHAT ARE internets?

Any large business or institution has many of the same kind of information sharing problems that led to the development of Internet technologies. It was not surprising that the commercial business sector rapidly employed these same internetworking technologies, applications, and standards - only to build special private internets. The same thing happened a few years previously with X.25 packet switching technologies which came out of the rich worldwide experimentation that followed the successful deployment of the ARPANET in the 1960s and became commercialized and offered as public services.

These (lower case "i") internets are extensively employed today in the form of enterprise networks to link together PCs, LANs, minicomputers, and mainframes throughout corporations or business sectors. Such internets, however, are often isolated and not part of Internet (upper case "I").

5.16 ON NETWORKS, SPIDER WEBS AND RANDOM WALKS

Micah I. Krichevsky, Director
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INTRODUCTION

I contemplated the possibilities of mechanisms and structures for transferring information on Biodiversity while visiting a wooded mountain top in New Hampshire. Lest this give the impression that I went there to indulge in a philosophical retreat, know that my daughter owns twelve acres of said mountain top and we were having a family gathering. Still, there was time for contemplation while viewing the woods and ponds and clouds.

The complexity and diversity of the useful information concerning biodiversity in all its aspects potentially is the most complex information gathering ever undertaken. In sheer volume, the automated data gathering by satellites, both looking down at the earth and looking out at the stars, fills tape after tape. Other so-called "very large data sets" occupy much attention and computer space.

In these systems, the volumes of information induce massive problems of scale. However, the stream of data is of consistent nature. While different parts of the spectrum may be measured by remote sensors in a satellite, the nature of the data and what is being measured (spectrally) are entirely defined. The users of the data can access these definitions and use them in interpretation and model building. I do not mean to trivialize these efforts. Clearly, a great amount of funding and intellectual effort goes into giving meaning to these measurements. I am in awe of the measurements that lead to conclusions that indeed black holes exist in space and that the "big bang" occurred and we can perceive the ripples thereof.

SYSTEMS ANALYSIS NEED

Those of us who have worked in describing and measuring biodiversity define it inconsistently. I will not attempt yet another definition. The following quote from G. Carleton Ray (Ecological Diversity in Coastal Zones and Oceans, in Biodiversity, edited by E.O. Wilson, National Academy Press, Washington, D.C., USA. 1988) illustrates the problems we face:

> "I suspect that diversity per se has little to do with the stability of most marine systems, i.e., the non-diverse systems are just as stable as those that are diverse. More to the point is whether characteristic diversity confers some predictability to ecosystems. Behind this important question lies our definition of a system. Ecosystems are far from chance physical-biotic associations or mere heuristic creations of ecologists; they are functional units in every sense of that term.....Following are some major factors that control coastal processes and that must be considered in defining the boundaries of these ecosystems:
>
> - watershed and receiving morphology
> - terrestrial and marine climates
> - winds, waves, currents and tides
> - fluvial discharge, bedload, suspended load, and dissolved load
> - terrestrial and marine biota
> - human use of land or sea

> "Even from this simple characterization, we see that ecosystem definition requires intensive field research coupled with complex analysis. Without such an effort, one cannot reach conclusions about diversity."

If we assume that the ultimate purpose of information transfer through networking of some sort is to "reach conclusions about diversity", then, clearly, we need high order information transfer from disparate disciplines and powerful ancillary analytic resources. To do otherwise is to be no more nor less useful than a paper publication or an encyclopedic data host. The network or network of networks is reduced to being a passive carrier of messages. Like the telephone system, the purveyors of networking services do not help in giving meaning to, or even help in, interpreting the messages.

The services are generally agreed by usage to be useful as far as presenting information but the users are then left to their own devices. There is real risk that the users will be enmeshed in an informational spider web and be consumed therein. Consider the sheer amount of potentially useful information that is contained in the communications leading up to this Workshop. Suppose that all the databases and networks mentioned are linked and accessible through a single menu system. Now consider the problem of the person wishing to integrate tidal information. chlorophyll content of the water near the coastline from satellite data, species and infraspecific diversity of mollusks and sea grasses, and the effect of commercial harvesting of clams. Consider further that the person is a social anthropologist. What path would be suggested if all the networks and databases listed were fully accessible to find out how to describe the sizes of mineral aggregates that surrounded or supported the mollusks and grasses?

Some years ago I spent some time at the California Academy of Sciences working on just such descriptors for site descriptions with the malacologists. At the time, the attempt was to evolve a systems approach to the information flow and content of the malacology collection.

Thus, I feel that a systems analysis should be done on the information sets that are useful in biodiversity information networking. The analysis should include current and potential availability, omissions, and pathways of access. This is not the same as a simple survey. The analysis should be done in depth and analyze data flow, economics, inhibitors to access, needs of field workers for information and submission of information, etc.

THOUGHTS ON NON-TRADITIONAL BIODIVERSITY CONSIDERATIONS AND NETWORKING

The article by Ray makes another point that I would like to bring to the fore for consideration by the Workshop:

> "The Forum on BioDiversity, whose participants have contributed to this volume, demonstrates a need in this respect [to give costal zones and oceans equal time]. The brochure announcing the Forum's program ..... depicts 13 insects, 6 mammals, 6 birds, 3 amphibians, a fish, and a reptile, and but three marine critters, all starfishes. Among the contributors to this publication are about 25 terrestrial scientists, overwhelmingly tropical, scatterings of economists and philosophers, about two-and-a-half classified as coastal or marine biologists, and perhaps one or two whose focus is the polar regions. ..... Meanwhile, there continues to be a benign intolerance in some conservation and development circles for supporting the basic research and concept development necessary for preservation of biodiversity. We are reminded to address the problems of the "real world." But whose real world?,....

> Science and conservation clearly need to be joined in a much more comprehensive alliance."

I would add that the microbiota are also neglected in considering the issues with respect to biodiversity and the information to be accessed. Often the information is intertwined and must be so considered for understanding. Some simple examples will illustrate the point.

I have alluded to the problems of the juxtaposition of information on legumes and nitrogen fixing bacteria in a previous communication. Since legumes are 40% of terrestrial plant species, one would think that the information on their rhizobial symbionts would be readily available along with the information on legumes. Such is not the case. ILDIS describes legumes. The WDC describes collections of rhizobia. The information from the MIRCENs concerned with rhizobia is not easily accessible except by the MIRCENs themselves. Even some of the MIRCENs concerned with rhizobia are not linked with the others. ICAITI in Guatemala has done research on the mass culture characteristics of rhizobia and the aforementioned WDC has specifically developed the information on the collections. Nobody is at fault. This is to be expected when networks grow without a firm systems base to their growth. Another area that is left out is that of epidemiology of infections. After all, epidemiology is nothing more than a subset of ecology wherein the disease process is the focus. Plant pathologists are better at recognizing this relationship. However, if I wish to investigate the diversity of salmonellae on a world-wide basis, I would start with the database collected over many years of the salmonellae isolated from products, both domestic and imported, by the US Food and Drug Administration. (This is mentioned only as an illustration since the database is not generally available at this time.)

Jeff Shaw, in another communication, gave the example of the biodiversity of both the protozoan parasite and the insect vector that transmits the parasite to mammals. This brings up an interesting question. In our haste to protect endangered species, what about endangered pathogens and vectors? Do we protect biting insects?

We should not forget the network of mycologists studying endangered fungi in Europe. I have no idea if they are electronically linked by now. If not, they should be.

The list of orphan areas is not limited to a domain of life form. As Ray points out, habitats are omitted. He cites, in addition to the omission of the coastal areas, the waters under the seasonally fluctuating polar ice. (From studies on the bacteria of Alaskan waters that we have done, I can certify that these waters are rich source of environmental information.)

I would add to his, such changing habitats as those in southern Florida as resorts and retirement communities are routinely sprayed to control mosquito populations. The spraying to control the Mediterranean fruit fly in California is another case. Related to this last case is the spraying of interiors of automobiles at check points in Guatemala.

Thus, I am sure that the information sources represented by the participants in the Workshop are a very small subset of that which is germane and extant. I am equally sure that the participants are aware of this. However, there is always a risk that sights will be set too low and the networks represented at the Workshop will come to be considered as the "core" of a nascent international network on biodiversity. Important they are. Core they are not. I doubt that a "core" can even be agreed upon!

WHO WILL DO WHAT?

The following is an excerpt from an article in Binary (M.I. Krichevsky. 1991. Developmental stages in the life cycle of international microbiological databases. Part 1 - genesis and taxonomy. Binary 3:16-19 | Part 2 - territorial imperative, survival strategies and life style. Binary 3:47-50.). Although the article speaks to databases, the thoughts apply just as well to international networks.

> "Oversight: All database activities, international in scope, should have an oversight group. This group should be independent of the operational staff with no overlapping membership. Further, the oversight group should strongly represent the users of the database. Where the database producers are part of a larger institution that institution should be represented in, but not control, the oversight group.
>
> "First, an oversight group often functions as an advocacy group as well. .....
>
> "Second, an oversight group can act to resolve problems among, and give direction to, international efforts to produces databases, especially when multiple institutions contribute to the whole. Democracies are reasonable constructs for a body politic. They do not produce databases at all well.....
>
> "Ownership: The ownership of international databases should be clearly stated from the outset. The database should be the property of, and copyrighted by, an international organization. This can be done directly. Alternatively, the international purpose of the database can be set forth in the legal documents establishing the database (e.g., articles of incorporation, contracts, official administrative statements of purpose).
>
> "Public, international ownership helps inhibit political tendencies to interfere with the free flow of information. In addition, such ownership renders moot the accusation that the database will be turned to local or national advantage. "Where ownership is vested in an organization which is not inherently international, a statement of purpose to disseminate information internationally becomes of paramount importance. Further, setting an early precedent of so doing would be helpful.
>
> "Database construction and dissemination: The database design, construction, and dissemination should be controlled by three elements: producers, users, and administrators. These elements should be represented in an operations committee that is quite distinct from the oversight body (to which the operations committee is ultimately responsible). In order to ensure that the database is designed and operates properly, the operations committee should establish, in sequence: function specifications, resources required, resource distribution criteria and procedures, operating procedures, and operations evaluation criteria and procedures.
>
> "The actual community of users must be represented strongly in decision making on both design and operations policies. Without this representation, no such service will succeed in gaining long term, wide spread acceptance. Therefore, there should be user members of the oversight body and the operations committee.
>
> "Persons responsible for funding, administrative decisions, and support must be represented at all phases of decision making as it is this group that is responsible for providing the necessary resources.

> "The information and subject matter specialists have responsibility for the technical aspects of the service to be provided. They must present the rest of the team with realistic and efficient technical proposals for design and operation of the database.
>
> "The operations committee should always be chaired by a member of the users' group to ensure that the users are first among equals in one direction and to ensure user commitment to the service in the reverse direction. The user as chair will usually be no problem where the initiative came from users in the first instance.
>
> "As a further guard against jurisdictional arguments, no person should hold a voting position on both the oversight body and the operations committee. A corollary to this is that no paid employee of the operating organization(s) should be a member of the oversight body."

I include this excerpt for a number of reasons. First, a workshop without action items resulting will only produce yet another Proceedings which already occupy much to much space on my bookshelves.

Second, a likely outcome is that the Workshop will set up some form of committee to do SOMETHING.

Third, the Workshop participants may wish to avail themselves of the experience of others who have set up international collaborations. At least some of our past errors and travail might be avoided.

Lastly, I believe that the users and administrators groups are under represented in the cadre of Workshop participants. I advise caution in formalizing any part of a networking infrastructure until such groups are better represented. There are many vested interests involved in the community concerned with biodiversity. Even if the stated purpose of the Workshop is purely technical, that fact will not be perceived universally by those not participating.

Any efforts aimed at improving access to biodiversity information through networking necessarily will require resources and administrative consent. Acceptance by much of the scientific community will be facilitated by the active endorsement of the doyens of "biodiversity".

The fact that many of such people are not actively engaged in networking activities at the moment could be useful. One of the fundamental questions to be studied in the proposed systems analysis would be: What kind of network design and contents would motivate and enable current non-users to become active participants in networking? Unless this question is answered adequately, the proposed network will command only a limited user community largely composed of those who could fend for themselves anyway.

5.17 LOW COST GLOBAL ELECTRONIC COMMUNICATIONS NETWORKS FOR AFRICA

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1) Introduction

Electronic mailbox and messaging services offer an ideal tool for enhancing communications in Africa. Electronic mail can be less expensive and more convenient than facsimile or telex wherever a computer and phone line are available. However, the communications infrastructure in the African countries varies from very good to very marginal. As a result, the appropriate communications solution may vary from one location to the next. This paper outlines the two basic means of connecting mailboxes to the global network and discusses which method may be the most appropriate under various circumstances.

2) Packet Switching Services in Africa

Many African countries are now installing packet switched data line service, also called IPSS (International Packet Switched Service) which uses the internationally standardized X.25 protocol. The PTT - national post office or telephone company is almost always the operator of such a service and usually installs connection points to IPSS in the major cities. This service allows modem users in these cities to make a local phone call, and get online to any country with an electronic mail or database service connected to the X.25 network. As long as the local phone service is reasonably good, a reliable connection to the host computer can be achieved and it is relatively simple to access a wide range of networks with this method. To overcome the frequent problems in local phone service, some IPSS providers are installing error-correcting modems; if the user also has a modem supporting the MNP error-correction protocol, virtually all problems of phone noise can be overcome.

To access such a service, the user orders a NUI (Network User ID) from the local PTT. A registration fee, a monthly or quarterly rental, and usage charges to connect to the remote host comprise the costs incurred for this service.

For regular computer network users, NUI rental usually provides a significantly cheaper option than making a direct dial international phone call to the electronic host. If the host is accessed infrequently, then the cost of an NUI may not be justified. As with a normal telephone call, there is usually a substantially higher usage charge for connecting to a host outside the country than with a host computer inside the country. However, since there are

still very few mailbox host computers connected to an IPSS anywhere in Africa, there is really no option but to connect outside the country for mailbox service and pay the high rates, until one of the developing systems becomes connected to packet services . The host service charges separately for the use of its services but for sending messages, up to 90% of the cost of the international connection can be in the charges made by the local PTT for use of the NUI.

Rate structures for IPSS are complex and vary enormously from one to country to another. Rental charges for a NUI can vary from $20 to $200 a quarter. Some PTT's require the user to rent PTT-owned modems at inflated rates. Even usage charges (which are based on time spent online and the volume of date passed down the network) can vary by a factor of two between different PTTs. Typically, the most significant portion for the charge is for the amount of data transferred. Users are charged both to send and to receive data, and this is frequently what makes the service prohibitively expensive.

IPSS service exists in a number of sub-saharan Africa countries, including: Cote D'Ivoire, Gabon, Kenya, Mozambique, Niger, Senegal, South Africa, Togo and Zimbabwe. Electronic mail users in neighboring countries may be able to make use of these packet-switching services if their phones support such calls.

In these countries with packet switching services, people in the capital cities, and occasionally other major cities, can reliably connect directly to a centrally located host in Europe or North America with relative ease. But as can be seen from the list above, most African countries do not have an IPSS service. Where it is available in these regions it is usually considerably more expensive than in the West.

3) Direct International Dialing

Because of the limited availability of IPSS services, and their high cost, international direct dialing is often the only realistic option. Previous experience with conventional terminal software and the bad telephone lines endemic throughout Africa, was that this method of connection was expensive, unreliable and stressful for the user. However, recent developments in personal computer based communications software have improved the situation. It is now possible to send messages and files over poor quality telephone lines at minimal cost using automated computer control led connections with file compression and error checking.

These programs typically reduce the length of the long distance call by 80-95% compared to the time taken for a standard interactive manually controlled session with the host. Even over a poor quality telephone line, they permit completely error free transmissions, without the need for manual intervention of the operator. Using this software is more like sending a fax than going through the series of 'log on' procedures necessary to connect to a remote host, yet it still gives all the benefits of computer communications.

Developed in the amateur bulletin-board system and academic communities over the last 10 years much of this software is free for non-commercial use or very cheap to purchase, running on any IBM compatible or Macintosh. Currently there are over 10,000 such systems exchanging messages and files globally. Messages can be prepared separately on any type of word processor and a 2400 baud modem costing about $100 serves to link the personal computer to the telephone line. The equipment does not require the installation of a separate line - existing voice or fax lines can be temporarily diverted to the modem while it places the call.

Any such system can also be left switched on for longer periods, in a state ready to receive messages from other such systems. This allows a system somewhere else to place the call and pay for charges, and still accomplish the complete exchange of messages. The file transfer protocols used between the two computers have a high level of resiliency to line noise and satellite delays, and if an interruption does occur, they are able to resume an transfer right at the point it was interrupted. This is particularly important for transporting large binary files where the chances of losing the connection over poor quality telephone lines is significant.

A high speed (9,600 bps or higher) modem becomes cost effective when the volume of communications increases, as in the case when several people share one personal computer for their communications. For the cost of about $400-$600, a modem such as the Telebit Trailblazer (TM) can transmit data 4 to 8 times faster than the 2400 baud modem.

Host computer services that will carry this traffic into the major networks are currently operating 24 hours a day in London (GreenNet), Stockholm (NordNet) and Toronto (Web). All support the high speed (9,600 baud +) protocols as well as the standard 1200 and 2400 baud protocols. These machines provide hourly gateway connections to all of the APC (Association for Progressive Communications) hosts in Brazil, Australia, Sweden, Nicaragua, US & Canada, and many countries in Europe. Messages can be sent through these machines to outbound fax and telex servers, to commercial hosts such as Dialcom and GeoNet, and to academic networks like Janet, BitNet, EARN, UseNet/UUCP and the Internet.

For many purposes, sending files and messages directly to another individual is all that is necessary. However, there is also the opportunity to 'broadcast' the message to a select group of participants. These 'mailing lists', also known as electronic conferences or bulletin boards can be publicly available to anyone on any of these networks, or restricted to a select group - for example a coordinating committee. The sender does not have to know the electronic address of each participant to send them each a message, instead a single message is sent to the predefined mailing list running on a host computer which then decides which systems to pass the message to. The list could comprise an unlimited mixture of fax numbers, telex numbers, electronic mail addresses and bulletin boards or conferences running on certain hosts. Conferences are usually based around a particular topic and can last for a short period or proceed for an unlimited time. They can be discussion oriented or merely a place to post news and information. Currently there are about 3000 topic related conferences that are available through the APC.

A self installing configuration of software to perform direct, automated international dialing is available for IBM compatibles and a running system can ideally be set up in half an hour by someone without any special skills other than basic familiarity with the keyboard. Occasionally there are a variety of problems that can crop up. Non-standard hardware configurations may need some trouble-shooting by someone familiar with the DOS operating system and DOS level commands. Hooking up the modem to a PABX type telephone system can be difficult, and may require the assistance of the phone company or PTT. Non-standard modems, telephones wired directly into the wall and operator assisted direct dialling can also be problematic for the inexperienced. For this reason it is probably best to consider each installation individually.

For someone familiar with the computer for word processing or some other basic application, a half day, hands-on training workshop is sufficient to acquaint the user with all that is necessary to send and receive files and messages. To maintain a system supporting group of

users, several days of training, as well as a commitment to provide personnel to maintain it, would be necessary.

4) Examples of Local Network Applications in Africa

Bulletin Board systems, both those packages designed for single users as described above, and full-scale systems supporting several users (not simultaneously, though), are already being used by a number of organizations in Ethiopia, Kenya, Uganda, Tanzania, Zambia, Zimbabwe and South Africa. The International Development Research Centre (IDRC) in Ottawa, Canada has been responsible for helping to establish many of these networks by funding the ESANET, PADIS, WEDNET and NGONET projects described below.

The NGONET Africa project is based out of the Environment Liaison Centre International (ELCI) in Nairobi, where a Fido bulletin board system has been set up to provide a conduit for electronic mail traffic in the region and to NGOs worldwide. This is done using a high-speed modem to make daily calls to the GreenNet Fido gateway in London. The project is also supporting the MANGO (Micro-computer Assistance for NGO's) Fido bulletin board project in Zimbabwe (see below) and plans to assist in the establishment of a third bulletin board system in Dakar and another possibly in Ghana.

In particular, support is being given to improving the flow of electronic information around the preparations for the UNCED conference in Rio, Brazil in 1992. An earlier survey found there were significant numbers of NGOs which had computers but were not using electronic mail yet. A total of 48 NGOs are being identified to receive modems, training, documentation and support.

ESANET (Eastern and Southern African Network) is a pilot project to link researchers at universities in Uganda, Tanzania, Zambia, Zimbabwe and Kenya with each other and with researchers worldwide by installing electronic mail facilities at the computer centres of universities in these countries. ESANET is based at the University of Nairobi Institute of Computer Science. To maximise scarce resources, coordination and technical support is being shared with the NGONET project. Where there is no local NGO host system it has been agreed that NGOs will be able to use the resources of the campus based nodes. Nodes are currently being installed in Kampala - Makarere University - nodename MUKLA, Nairobi - nodename UNICS, Dar es Salaam - University of Dar es Salaam/Eastern and Southern African Universities Research Project - nodename ESAURP, Lusaka - University of Zambia Computer Center - nodename UZCC, and Harare - University of Harare Computer Centre - nodename UHCC.

Each node runs a suite of Fido software on an IBM çompatible AT with 40MB hard drive, high speed modem (PEP) and dedicated phone line. Zambia, Kenya and Harare can connect directly to the GreenNet Fido gateway (GNFido), while Uganda and Tanzania can only connect via Nairobi because direct dialling facilities outside the PTA (Preferential Trade Agreement) area are not available. Zambia has begun to experiment with direct dialling to London and the other nodes are expected to begin testing connectivity later next month. They are still awaiting arrival of hardware shipped from Nirv Centre (Web) in Toronto, Canada.

HealthNet is operated by a Boston based NGO called Satellife which was initiated as a project of the International Physicians for the Prevention of Nuclear War (IPPNW). Satellife have purchased 60% of the capacity on the University of Surrey (UK) built Uosat-F satellite.

This will initially be used to exchange health and medical information within the same Universities (coincidentally) participating in the ESANET project and via Memorial University in Newfoundland Canada. Memorial is an appropriate site because of Dr Maxwell House' work with telemedicine and because it is so far north the satellite passes overhead 10 times a day on its polar orbit.

Because of the total overlap in institutions in Africa, the HealthNet project is being administered by the African participants as part of the ESANET project to evaluate alternative data transport methods.

Although the current traffic is limited to health related issues, it will be up to the individual participating institutions in Africa to obtain clearance from the authorities for a wider interpretation of the health mandate. As far as the funders of the HealthNet project are concerned, this could encompass a much broader range of environmental and social issues. Currently however, only Zambia has been successful in obtaining approval for the installation of the ground station and this was with a specific medically oriented application.

The Zambian approval nevertheless sets a precedent for the authorities in the other countries. Also Zambia will now be able to host satellite traffic from the other participating countries via direct dial telephone lines with the ESANET Fido network until other ground stations have been approved.

The Pan African Documentation Centre Network - PADISNET is a project to link 34 countries into a network of participating development planning centres which exchange databases and information. PADIS is based at the United Nations Economic Council on Africa (UNECA) in Addis Ababa which also operates a Fido node connecting on demand to London, South Africa and the US. NGONET and PADISNET project workers have held joint workshops it is likely that the two projects will be able to share resources in the support of other nodes in Dakar-Senegal (CRAT), Accra-Ghana (AAU), Dar es Salaam-Tanzania (ESAURP).

WEDNET supports research on women and natural resource management. The aim is to link researchers in Senegal, Ghana, Burkino Faso, Nigeria, Sudan, Kenya, Zimbabwe, Zambia and Canada via electronic communications and conventional networking. WEDNET is also based at ELCI in Nairobi.

WorkNet operates as the national electronic network host for NGOs in South Africa. The network has been established for about three years and now has about 150 users on a multi-user BBS programme called MajorBBS. Users include the labour movement, human rights groups, the alternate press, documentation centres, service organisations and church groups. The ICTFU has funded the development of gateway software which will allow MajorBBS users to send messages to other systems and obtain conference postings. The MajorBBS format is converted to the Fido standard and a separate machine operates as a Fido bbs to transmit and receive the messages. The Fido machine is now officially registered on the Internet (worknet.alt.za) and is in daily contact with MANGO in Harare and the GreenNet Fido gateway in London via high speed (PEP) modem. An X.25 leased line is already on premises awaiting the installation of X.25 software and PAD in September/October.

MANGO is a bulletin board service in Harare, Zimbabwe, operated by a collective of NGOs:; Africa Information Afrique (a regional news agency), EMBISA (religious development group), SARDC (Southern African Research and Documentation Centre),

EDICESA (Ecumenical Documentation and Information Centre for Eastern and Southern Africa), and SAPES (Southern Africa Press Service). It was recently agreed that the system be made available to the NGO community as a whole and a seed structure has been developed. MANGO now connects three times daily with the Web Fido gateway in Toronto. In addition it connects three times a day to WorkNet in Johannesburg.

ARSONET is a CIDA professional development project to link the Africa Regional Standards Authorities in Addis Abbaba-Ethiopia, Nairobi-Kenya and Cairo-Egypt with Fido networking technology.

In all these networking initiatives users are connecting to their nearest host node. This provides them with a link to the global network for receiving or sending private messages and public bulletins via a gateway operating at the Association for Progressive Communication's London host - GreenNet. Through this system users in Africa can gain access to the community of 10,000 NGOs and individuals working in peace, social development and environmental issues who use the APC network.

With a 2400 baud modem, users are reliably achieving transmission speeds of 220 characters per second (cps), even on relatively poor phone lines. Because the messages and files are automatically compressed before transmission to as little as one third of their original size (and even more for fixed length record databases - up to 10 times) it is possible to send or receive about 40,000 characters (about 6,500 words) during a one minute call. Because the connection between the computers is all under control of the machine at each end, the only time when the full 220 cps transmission speed is not being achieved is during the first 10-15 seconds while handshaking between the two computers takes place.

5) Creating African Electronic Mail Host Systems

The methods and systems described above are the early stages of establishing full electronic mail hosts systems in Africa, owned and operated by Africans.

Complete electronic mail, computer conferencing and database systems are now being run on small and relatively inexpensive microcomputers ('286, '386, SPARC based hardware platforms can all be set up for between $5,000 and $15,000). Locally-based systems such as these can greatly reduce the costs to the individual user of computer-based telecommunications. In this case users can make a local phone call and share the cost of the international connection, rather than all individuals competing for scarce and expensive international lines.

The benefits of such local operations has been proved by small UNIX systems installed by the Association for Progressive Communications, the RIO project in French-speaking countries of Africa and the Carribbean, and by the Bureau for Latin America of the United Nations Development Programme in Cuba, Bolivia, Ecuador and Costa Rica, and by BBS systems operating in several Eastern European and African countries. These benefits include service at a far lower cost than directly accessing a host in the US or Europe.

There is now a variety of software and hardware available for this purpose. Selection is not easy; some factors to consider include not just the cost of the original equipment, but the availability of skilled technical people to maintain the system, the availability of spare parts, and the cost and availability of technical support from vendors. The significant barriers to rapid implementation are the need to train system operators and the high state tariffs on computer and communications equipment.

The challenges of making this technology work in Africa are balanced by significant rewards. African countries are in a position to leap-frog technologies and install relatively sophisticated information technology now, skipping older, less effective techniques and methods. With this kind of information system in place, dialogue and information exchange regionally and internationally can greatly expand, with benefits to every sector of African development.

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5.18 AIMING FOR THE ELUSIVE PAYOFF OF USER NETWORKS: AN NGO PERSPECTIVE

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Abstract

Electronic transmission of data over long distances, combined with the development of user networks, has become a powerful enabling technology - and a challenging opportunity - for nongovernmental organizations (NGOs). Over 100 nations now have some form of connectivity, but the poorest nations are the most poorly connected. These least connected nations represent over half of the world's population. Yet they are desperately in need of the rapid, low unit-cost information-transfer capabilities offered by this powerful and robust technology. The numerous NGOs that work in developing areas of the world have important potential roles in using these high-yield technologies for disaster relief as well as routine information transfer. They have a significant but so far largely unfulfilled opportunity to leverage this technology toward the needs of the poorest nations. This paper elaborates the scope of the data communication opportunity and gives examples of NGOs of various sizes and missions in their implementation of information technology networks. An agenda for action offers specific suggestions that can lead NGOs to obtain greater leverage from existing networks.

Keywords: communications electronic-mail international-development networks NGOs technology-transfer

Introduction: The Proliferation of Electronic Networking

Computer Mediated Communications Systems (CMCS) exemplified by electronic mail (e-mail), on line data systems, data-base retrieval systems, etc. are well known, but their immense capacity, low unit cost and dramatic growth are not fully recognized. In developed parts of the world, CMCS are used in businesses, in universities, in primary and secondary education and in the home. The number of messages sent on CMCS globally - often as e-mail - is very large; the rate of increase per year is already over 30% and increasing [12]. In the United States alone the volume of traffic per month on NSFNET has increased 100-fold, from 100 million to 10 billion in only four years [3]. A global, online, database locator at McGill University served 30 inquiries per day in November 1990; by September 1991 it was serving 2,600. The appeal of these networks lies in their quick, cheap and relatively error-free connectivity among millions of sites around the world and a compelling sense of immediacy. A part of this structure has been used primarily to connect researchers. Research networks include BITNET in the United States, EARN in Europe, GULFNET in the Persian Gulf, JANET in the United Kingdom, NETNORTH in Canada, and SWIFT in Switzerland.

Some of them have operated for over a decade and offer very low unit costs to their users. Internet, the giant of them all, is a global network of networks with some 770,000 multi-user nodes and an exponential growth rate.

The reasons for the low unit cost of e-mail are easy to understand. First, the major tasks of network analysis and planning are already completed. Thus, investments in software and cadres of specialists at key node locations have been carefully rationalized over a period of several years. Stability of services as well as increasingly efficient system performance are common results [16]. Second, as usage increases, the large capacity of electronic channels tends to serve increasing volumes of message traffic, offering the economic advantages of scale. For example, the BITNET membership fee for a large university (usually in the range of $5,000) together with an allocation for some user services personnel may approximate $100,000 per year. Computer costs are relatively low since the minicomputer that handles the message traffic is often used for many other tasks too. If this large institution sends 5,000 messages a day, the unit cost is about one cent per message. Moreover, the saturation level of network users is growing: at Syracuse University it is over 50% and at least 4,000 professors and students have network connections.

A third reason for the relatively low cost of e-mail is that it is so far not viewed by the general public as a service that competes on the basis of usefulness with telex or fax transmission. Thus, it is not perceived as a threat to the pricing structure of those technologies. In actuality, the networks are as dependable as any other type of service. But most users of fax and telex do not consider e-mail as an equally acceptable medium of messaging. Rather, it is viewed as a contrivance, an artifact that is still under development. Studies in Latin America [17] and Eastern Europe [18] showed that e-mail services were at least one and often two orders of magnitude lower in unit cost than fax or telex, at similar levels of service. That is, sending a five-page message from Prague to New York or Santiago to New York costs perhaps $.10-$.25 compared to $5 to $15. Moreover, sending e-mail messages is relatively easy: the sender in Prague uses a few simple keyboard commands; the file is sent within seconds to New York.

Network Connections: Haves and Have Nots

Unfortunately, the spread of e-mail technology has followed the path of many other technologies -- wealthy nations are quick to utilize it and gain benefits, while poor countries must wait. Table 1 gives a summary of the levels of connectivity of nations of the world, classified according to the complexity and scope of their e-mail services [15]. We include under the heading Excellent the countries that have the capacity to use four major connectivity services: Internet, UUNET, BITNET and FidoNet. Under Good we include the nations that have two or three of four target capabilities; countries listed as Poor have only one. The category No Service includes countries that are unable to connect using the simplest modalities. About three-fourths of the countries of the world and over half of its population are characterized by poor or nonexistent services. It is not surprising that most of the countries that are poor in the context of telecommunications are also classified by the UN Human Development Report as "Low Human Development" nations [20].

Table 1 Quality of Connectivity By Nation

Type of Conectivity	Number of Countries	Aggregate Population, Billions (Percent of Total)
Excellent	31	1.220 (22.4%)
Good	28	1.463 (26.8%)
Poor	48	1.662 (30.5%)
None	125	1.102 (20.3%)

NGOs: Many Types, Many Tasks

People know of the existence of NGOs, although they may not appreciate what NGOs do that neither government nor business seems to do as well. They vary greatly in purpose, size, and sponsorship. Many of them are known for helping the poor and unorganized to improve or take control of their lives. NGOs are numerous and uncounted: there are an estimated 11,000 in the Latin America-Caribbean region alone, most of recent origin [4]. A recent European compilation [19] shows that the NGOs specialize in agricultural issues, alternative trading, appropriate technology, arts and culture, audiovisual methods, children, cooperative movements, coordination, consumer issues, consumer unions, decentralized cooperation, development education, disabled persons, documentation ..... only through the letter D in the alphabet.

Examples of NGOs, from Local to Global

The Women's Water Committee (Mukusi, Zambia) was started by a group of women who were dissatisfied with their village's only water supply: it was inconvenient to access and hazardous to health [14]. They sank dozens of boreholes and installed reliable handpumps; thousands of persons lined up to fill their buckets and plastic jerry cans. The status of women in the village has improved because they manage the new water system. Now the committee plans to improve sanitation by eliminating open garbage heaps in favor of burial pits and build improved, ventilated latrines.

The Junior Engineering and Technical Society (Alexandria, Va.) is a nonprofit, Nationwide organization for precollege students interested in engineering and technology. It sponsors student competitions, a National Engineering Aptitude Search, and engineering design contests. Its paid staff of three persons produces a newsletter for 35,000 student subscribers at some 2,200 schools and responds to 10,000 requests for career guidance each year at no charge.

CARE (New York), a global NGO, has 65 field offices in Latin America, Asia, East Africa, and West Africa. After Bangladesh's 1991 cyclone, the 1,600-member CARE staff in that country distributed food supplies to 400,000 people and 55,000 tons of wheat to 2,000,000 farmers. After the Persian Gulf War, CARE set up refugee camps at the Turkish border and provided vital supplies to 240,000 people. CARE projects feature primary health care, population and family planning, agriculture and natural resources, small economic activity development, training, food assistance, and emergency response.

Using Data Communications - Some NGO Success Stories

Can NGOs, small and large, use electronics to break down the barriers of isolation from peers, clients, and patrons? Here are examples of how NGOs are using modern communications technology.

A woman who leads a conservation data center in Indonesia uses a PC and a modem to send critical environmental data by e-mail to The Nature Conservancy and other organizations quickly and at low cost. The Nature Conservancy, a U.S.-based NGO, is implementing an e-mail network which, together with its local-area network (LAN), will allow the staff to share proposals and planning documents with NGOs in other countries to make better and faster funding decisions.

SatelLife (Boston), a not-for-profit organization, distributes medical information in sub-Saharan Africa by low-Earth orbit satellite and e-mail. An international health official says, "Establishing reliable communications may be one of the most important priorities for improving health in Africa." [6] Telephone service is poor in quality and high in cost; sending a 6-page fax from Benin to Nairobi can cost $300. The Boston office communicates with its African staff through PeaceNet and FidoNet, both global, nonprofit networks, taking advantage of the dramatically lower unit costs of this service compared to more traditional methods of communication. HealthNet, the satellite-based message service, now operates in Kenya, Tanzania, Uganda, and Zimbabwe; countries are being added. The New England Journal of Medicine allows free electronic distribution on HealthNet of articles requested by African doctors. Electronic distribution of a medical newsletter started in March 1992 using a variety of technologies. HealthNet's clients are universities and, through them, doctors and medical societies.

Volunteers in Technical Assistance (Arlington, Va.) has pioneered the development of satellite-based packet-radio technology for remote areas of the world. VITA uses an opportunistic mix of communication methods for its own field projects. Its small-business development project in Chad (where phone service is poor) operates from two cities linked by packet radio. A FidoNet link between Arlington and the capital city of N'Djamena is planned. Elsewhere in Africa, its solar- energy project in Djibouti loads technical questions onto VITA's satellite; the questions are referred to Sandia Laboratories in New Mexico by satellite for quick response. An agricultural infrastructure project in Afghanistan is headquartered in Peshawar, Pakistan; data are being exchanged with Arlington by a low-cost, U.S.-initiated modem call, but a satellite ground station has come on line. As a service, this link will also carry UN refugee affairs messages between Geneva and the UN High Commissioner for Refugees in Peshawar via Arlington. Most significantly for VITA operations, all message traffic is centered on its bulletin-board system, which is freely accessible to VITA's staff and Volunteers.

Recording for the Blind (Princeton, N.J.) produces and distributes audio tapes of current textbooks for cost-free distribution to 27,000 active users, with the help of 4,800 volunteers working in 31 recording studios throughout the United States. Borrowers typically are students at the secondary, college, and professional levels. The studios use modem-to-modem communications to access the central databases at Princeton and ensure that borrowers' requests are promptly assigned to studios that have the needed volunteer skills.

The Famine Early Warning System (FEWS) includes state as well as nongovernment organizations; the main performer is Tulane University in Louisiana [3]. The purpose of this large, 7-year old effort is to reduce the risk of famine in an east-west strip of African

countries from Mauritania to Ethiopia and Eritrea. Technical organizations in the United States and the United Kingdom provide remote-sensing image data, in digital form, related to cloud cover and precipitation. The data are interpreted by experts in Africa; the information is then sent to the United States and translated into recommendations for African farmers, NGOs, local government agencies, and lending institutions. But people carry the data on diskettes in both directions. The express company DHL International carries a diskette to a remote area of the world for $70 with 4-day delivery guaranteed.

The present plans of FEWS to put FidoNet nodes in the targeted countries can bring dramatic improvements in project effectiveness. For example, the present ten-day information cycle can be shortened. Costs will drop and experts located in different targeted countries can easily consult each other.

Impediments to NGO Use of Networks

In many parts of the world, voice telephone does not work well and the cost of a postage stamp for international mail is two days of salary of a university professor. Many NGOs that need telecommunications prefer the most basic methods of communication: voice phone, fax and telex. These methods are the most costly and they are not useful for data transfer: databases, spreadsheets, technical graphics, and word- processing manuscripts. In view of the savings of money and time, as well as other advantages, there must be important obstacles to the greater use of electronic-communications technology by NGOs. Assuming motivated operators and managers, the principal obstacles to adoption of better technologies are as follows:

-- Poor local infrastructure, including a broad and variable list of factors (considered in a later section) that impede the transfer and endanger the viability of any advanced technology.

-- Inaccurate perception that startup costs are high.

-- Lack of information on how to acquire the technology.

-- Fears that introducing the technology will divert attention from high-priority tasks, or disturb work flow or staff relations.

-- Inaccurate perception that the technology is not needed.

Gaining the Potential Advantages
Examples of Low-Cost, High-Yield Approaches

Many NGOs already have the equipment they need to get started. The minimal configuration for realizing benefits includes a PC or other microcomputer, a modem, and ready access to an enthusiastic, computer- literate person. The approaches within reach for low-cost data transmission are usable individually or in combination; they are summarized as follows:

Approaches requiring telephone line and modem.

-- Modem-to-modem data transmission. At pre-arranged times, a computer in an industrial country telephones its partner in a developing country and carries out a two-way exchange of data [10]. The success of this method is due to the comparatively low cost of originating

the phone call in an industrial country, and to the recent development of automatic error-checking methods for file transfer over noisy phone lines.

-- Electronic networks, many of them carrying e-mail, can transmit data and files. Of special interest are the nonprofit Association for Progressive Communications, whose global networks provide low-cost service to 14,000 subscribers in 92 countries, and CGNET Services International. Many of their subscribers are NGOs. Among networks, FidoNet deserves special mention because of its low cost, availability, and effectiveness. It is a noncommercial, telephone-linked network of computer hobbyists, totally user supported; the world node list is updated every week [9]. Through "gateways", FidoNet operators can access the major global networks. Many operators also run bulletin boards, which may provide public access to global networks for persons who lack network accounts. The software for setting up a Fidonet node is free or inexpensive. There are hundreds of thousands of Fidonet nodes in the world; may with multiple users; in all of Africa outside of South Africa, there are about 9 nodes.

-- Bulletin board systems (BBSs) are operated by microcomputer owners. Excellent software for operating BBSs is available free. A BBS can be dialled on the public telephone system by other computer users. The caller can read or leave messages, and transfer files to or from the BBS. Through many BBSs, any computer user can access international E- mail networks for a fee or no fee; one recent listing shows 116 U.S.- based BBSs that offer open access [7]. There are relatively few BBSs in developing countries, but Jensen and Sears [13] report their recent rapid increase in Africa.

Approaches not requiring a telephone line.

-- Packet-radio systems. These transmit digital information with extremely high accuracy and often at very low cost. The power of packet radio to reach remote areas is vastly increased through satellite technology. A complete, solar-powered ground station (including microcomputer) for communicating with a satellite now costs about $7,000.

-- Amateur ("ham") radio technology provides the oldest and best established public telecommunications network [1]. There are 450,000 hams licensed in the United States and 1,574 licensed in 37 countries of Subsaharan Africa. Ham radio is probably underused by NGOs.

Agenda for Action

We have described some of the ways NGOs now benefit from the low- unit cost, high-yield capabilities of the emerging networks. We now summarize some of the most successful implementations from the perspective of management support, hardware and software, training and viability.

Management Support

Since most NGOs are small, focused, and local rather than global in scope, their leaders must become aware that the steps needed to connect to a broader group of users are relatively simple, less expensive than expected, and capable of offering massive leverage from a small investment. Thus, ways must be found to explain to key NGO personnel the rudiments of connecting to networks, including many positive examples of the types we have described. This objective can be reached in several ways. For example, a larger, successful NGO with experience and competence in the region, acting as an agent of technology transfer, sets up

training for managers and offers to connect with smaller NGOs on a phased basis. The more experienced organization can be nearby or in a distant country. It is crucial to focus on the specific tasks and needs of each NGO and on assuring that a fully functioning cadre is left behind. Some nonprofit NGOs specialize in transferring communication and other information management technologies to smaller organizations at cost. Examples include Telecommunications Cooperative Network (Washington, D.C.), TechnoServe (Boston, Mass.) Massachusetts, and Volunteers in Technical Assistance.

Hardware and Software

Few hardware or software problems in network connectivity have not been solved in some location or another. There is a vast amount of information about what works and what doesn't in hardware, software and network services. For example, a new connection to Internet and BITNET is being developed by the Escuela Politecnica del Litoral in Guayaquil, Ecuador, under a grant from the Mellon Foundation for Value Added Services (VAS). VAS aims to make so much information available to the key leaders of this polytechnic and its 900 faculty members that there are few unsolved problems at implementation time. In Brazil, NGOs buy microcomputers for $1,000 to $2,000 and join Alternex, a Brazilian network that connects indirectly but quickly and cheaply to peer organizations in 70 countries [2].

Training and Follow-up

Usually, the most crippling infrastructural shortage in developing countries is of technically trained persons and technical services. Two steps are needed. First, training must be supplied by visits or short courses conducted in the client country or, if abroad, by persons familiar with conditions in the client country. The second essential step consists of follow-up activities that address local technical problems as they arise, with a short response time, and provide continuing advice and encouragement. The follow-up activities should be planned so that they do not foster dependence on the donor.

Forming Partnerships

In addition to training, there are often shortages of equipment, foreign exchange, literature resources, and planning tools. Other impediments may include slow or uncooperative customs procedures, bad telephones, a poor dealer network, and failure of new software and hardware to perform as expected. It may happen that local policy makers, unaware of the high return from investment in communications, cannot be persuaded to support it, or even to license modems [11]. Many infrastructural deficits take time to overcome, but are often best addressed by forming an enduring, voluntary, professional partnership with a peer in another country. The result of this arrangement is that both sides share some of the infrastructural resources of the country that is better off. There is often a two-way flow of technical information that benefits both sides. Once low-cost, international electronic messaging is launched, it becomes easy to join international groups of peers who share interests through electronic messages and documents, and can help each other. On BITNET alone, there are more than 2,000 such groups.

Space does not allow us to thank individually the many persons consulted during preparation of this paper. The references listed below exclude annual reports and other organizational prospectuses.

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5.19 WHAT IS STUDENT ENVIROLINK AND WHY IS IT HERE

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This group exists to provide free information for environmentalists around the world, for the discussion of issues both profound and mundane that matter to us. Because we are drawn together by a common belief in the preservation of all that is wild, much of what we discuss reflects our shared set of core environmental values. What enriches the discussions is both the support that is expressed for others *and* the diversity of beliefs that are expressed and respected within this forum.

WHO READS STUDENT ENVIROLINK'S NETWORKS?

We are over 300,000 strong and are all students, professors, managers, biologists (eco-, wildlife-, marine-, conservation-, ecologists, administrative staff, ..., parents, and mates. Some read from campus or their place of work, while others read the posts second-hand from thoughtful friends. We are women & men of many colors, spiritual centers, and socio-cultural backgrounds. Our readers literally span the globe in over 31 countries.

The one thing that we all have in common is that we all care for the earth and want to make sure that the beauty that now exists in nature will exist forever.

WHAT NETWORKS CAN I JOIN

Student EnviroLink, for the time being, consists of four different networks:

EnviroLink - A moderated network that will send you general announcements, calls to action, news stories, etc. This is not a discussion network, in that only the administrator (Josh Knauer- <jk71@andrew.cmu.edu>) can post to it.

SEACnet - A network that consists of over 30 different lists. This network is solely for the purpose of discussing issues relevent to the Student Environmental Action Coalition (SEAC). To subscribe to SEACnet, send mail to: <seac+forms@andrew.cmu.edu>. Specific information on all of the lists will then be sent to you.

GREEN - This is a revamped version of the old GREEN-L discussion list. It is an unmoderated discussion network dedicated to issues surrounding the Green Movement all around the world. This network will also serve as the means for discussing issues on EnviroLink.

GREEN-ORG - This is also a revamped version of the old GREEN-ORG discussion list. It is an unmoderated discussion network dedicated to issues that Green organizations face in the world today.

HOW TO PARTICIPATE

How To Subscribe, Unsubscribe, Change Address

All requests to subscribe or terminate participation in any of the networks (excluding SEACnet) should be made to:

env-link+join@andrew.cmu.edu

Similarly, if your email address is going to change, please make the request for change to:

env-link+change@andrew.cmu.edu

Please send requests to subscribe like so:
e-mail address network name name
It is important to include your e-mail address in the request because the return address in the mail header is frequently inadequate, i.e. it will bounce.

How To Post

To request that information be posted to EnviroLink, send mail to:
env-link+@andrew.cmu.edu
If the message is just for the moderator, but not for distribution, please mark it as such. (Don't be subtle: mark the "Subject:" of the message "NOT FOR DISTRIBUTION".) The moderator collates messages and distributes to the distribution list with another alias.

To post DIRECTLY to the GREEN list, send mail to:
env-link+green@andrew.cmu.edu

(This will automatically forward your message to all of the people on the GREEN network)

To post DIRECTLY to the GREEN-ORG list, send mail to:
env-link+greenorg@andrew.cmu.edu

(This will automatically forward your message to all of the people on the GREEN-ORG network)

Conventions

Unlike many other forums, we ask that you minimize your quotations from prior messages. Where possible, use a simple paraphrase & a reference back to the original message number, person, or topic. The message number is the least ambiguous, but also the least humanistic. The moderator will respect your decision about how to reference previous comments.

Please append your optimum mail address after your name. There are many shy people who read this list who would like to send a word of encouragement, support, or to share their own feelings, but who are not comfortable doing that to a distribution of over 300,000 people. Unless told otherwise, the moderator will append the sender's address from the message header if none is provided. This is rarely an optimum address. Please limit personal e-mail conversation to just that, if you are responding to what someone said, and are not adding anything new to the conversation, send it directly to the person, bypassing the network.

Ground Rules

The ground rules for posting pretty much fall out of our statement of purpose. Discussion and debate are welcomed, with the understanding that we maintain an atmosphere of mutual respect and honesty with each other. There is always room for expression of righteous indignation, but not for abusive attacks.

NEVER cross-post to any of the Student EnviroLink networks!! This only slows down our efficiency and creates uncomfortable circumstances for readers and administrators alike. ANYONE who cross-posts to the networks will be terminated from distribution lists immediately, no questions asked. This is a harsh policy, but is there for a reason. The definition of cross-post(ing) is as follows:

ANY piece of mail that is sent to more than one network.

The only time you will ever see a cross-post is from the administrators of the networks. This will only be done when a message urgently needs to get out to all subscribers.

ROLE OF THE MODERATOR IN ENVIROLINK

The moderator provides:

(1) timely redistribution of messages, in order to keep environmentalists "on top" of the current issues.

(2) corresponding with active contributors when the administrator believes their messages do not meet the "ground rules" for the forum. This may mean refusing to post a message, or requesting that the submitter rephrase or rethink the submission.

(3) requesting input from the readership on issues related to the management of the forum, then making decisions & communicating them to the readership.

ROLE OF THE STUDENT ENVIROLINK NETWORK ADMINISTRATOR

The head administrator is the keeper of the distribution database, adding and deletes recipients by direct request from the individual. The procedure for these requests was provided above. It is impossible to provide instant response to requests for addition, deletion, or update of mail address, so please give us as much notice as possible. Normally, we hope to get requested updates for distribution accomplished within 1 week of the request.

The distributor also handles bounced mail. This is no trivial task, given the complexity of the forwarding mechanism we've inherited.

The current administrator and creator of the Student EnviroLink Networks is Josh Knauer, a sophomore at Carnegie Mellon University in Pittsburgh, Pennsylvania.

Mail of a personal nature can be sent directly to him at:
<jk71@andrew.cmu.edu>.
Please realize that we at Student EnviroLink are all volunteers and students, we do not get paid or reembersed for our many hours of time and labor spent on creating this free network. All computer equipment is provided by the volunteers who make this network run.

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5.20 INTERNATIONAL WORKING GROUP ON TAXONOMIC DATABASES FOR PLANT SCIENCES (TDWG)

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TDWG was started in 1985 as an international working group to explore ideas on standardization and collaboration between major plant taxonomic database projects. Members include institutions and individuals responsible for botanical databases.

TDWG is affiliated with the International Union of Biological Sciences (IUBS) as the Commission on Plant Taxonomic Databases. The goal of TDWG is to establish international collaboration among plant taxonomic database projects so as to promote wider and more effective dissemination and exchange of information.

TDWG recognizes that existing taxonomic databases will use different software, hardware, and file structures. The primary objective of the organization has been to promote common use and interpretation of terminology, data fields, dictionaries, and common logical rules and data relationships. To further this aim, TDWG forms working subgroups to develop standards and considers other standards developed independently by institutions and individuals. TDWG annual meetings provide a forum for discussing the form and content of the proposed standards, for voting on the adoption of standards, and discussing other aspects of taxonomic databases. The standards adopted by TDWG are made available in published form so that those responsible for taxonomic databases may consider them, both in the planning of new projects and in the management of existing ones.

For those initiating a new project, the standards illustrate how at least several other databases have thought it best to go about a task avoiding repetition of design effort and illustrating how to overcome difficulties that may be encountered. If the decision is made to use a standard for a particular database (a completely voluntary decision, of course), it becomes easier to exchange data or collaborate with a growing community of other databases using the same standard. Organizers of established databases may find that the standards suggest ways of organizing data for communication and may want to consider these internationally developed standards in future revisions of their data structure and content.

The standards published by TDWG will be enhanced and updated when considered necessary. All correspondence should be sent to the TDWG Secretariat. Anyone interested in the development of plant taxonomic databases is encouraged to become a member of TDWG (there are both institutional and personal members), to attend the annual discussion meetings, and to receive the TDWG Newsletter.

A list of TDWG members and a list of standards published or endorsed by TDWG follows.

TDWG Secretariat James L. Zarucchi, Missouri Botanical Garden, P.O. Box 299, St.Louis, Missouri 63166 (USA)

TDWG Publication Series

Series Editor: Ellen Farr (Smithsonian Institution)

Technical Editor: James Beach (Harvard University)

Members of TDWG (December 1991)

Institutional Member
Australian National Botanic Gardens (Australia)
Australian National Herbarium-CSIRO (Australia)
Australian National University (Australia)
BIOSIS (United Kingdom)
Bernice P. Bishop Museum (USA)
Biosystematics Research Centre, Ottawa (Canada)
Botanic Gardens Conservation Secretariat (United Kingdom)
Botanical Institute/Library-Aarhus (Denmark)
Botanischer Garten und Botanisches Museum-Berlin (Germany)
Bureau des Ressources Genetiques (France)
Conservatoire et Jardin botaniques (Switzerland)
Harvard University Herbaria (USA)
Hunt Institute for Botanical Documentation (USA)
International Mycological Institute (United Kingdom)
Missouri Botanical Garden (USA)
Museum National d'Histoire Naturelle (France)
Natural History Museum, London (United Kingdom)
New York Botanical Garden (USA)
Real Jardin Botanico, Madrid (Spain)
Royal Botanic Gardens, Edinburgh (United Kingdom)
Royal Botanic Gardens, Kew (United Kingdom)
Royal Botanic Gardens, Sydney (Australia)
Royal Ontario Museum (Canada)
Smithsonian Institution (USA)
USDA-ARS, Systematic Botany and Mycology Laboratory (USA)
University of Alabama (USA)
University of Helsinki (Finland)
University of Pennsylvania-Morris Arboretum (USA)
University of Reading (United Kingdom)
World Conservation Monitoring Centre (United Kingdom)

Project Members

Association of California Herbaria (USA)
Botanical Diversity of Jureia Mts., Brazil (Brazil)
Databank for threatened plants in Sweden (Sweden)
Flora de Veracruz (Mexico)
ILDIS (United Kingdom)
USDA-SCS, PLANTS Database (USA)

Individual Members

Allkin, Robert (United Kingdom)
Almeida, M. Teresa (Portugal)
Balslev, Henrik (Denmark)
Barkworth, Mary E. (USA)
Beach, James H. (USA)

Beaman, John H. (USA)
Bolden, Eric A. (USA)
Coode, M.J.E. (United Kingdom)
Dallwitz, M.J. (Australia)
Giulietti, Ana Maria (Brazil)
Holmgren, Noel (USA)
Knupffer, Helmut (Germany)
Lopez-Quintana, A.J. (Spain)
Morse, Larry E. (USA)
Ordonez, Maria deJesus (Mexico)
Pankhurst, R.J. (United Kingdom)
Parmasto, Erast (Estonia)
Strid, Arne (Denmark)
Stutzel, Thomas (Germany)
Weber, Nancy S. (USA)
Wright, Anthony E. (New Zealand)
Xu Kexue (China)

Standards Currently Endorsed by TDWG (September 1991)

TDWG Publication Series

Data Exchange

Botanic Gardens Conservation Secretariat. 1987. The International Transfer format for Botanic Garden Plant Records. Plant Taxonomic Database Standards No. 1. Pittsburgh: Hunt Institute for Botanical Documentation. (A standard adopted by botanic gardens for recording and exchanging specimen data.)

Other Published Standards Adopted by TDWG

Authors

Brummitt, R. K. and C. E. Powell, Eds. 1992. Authors of Plant Names. Kew: Royal Botanic Gardens. 731 p. (Names and abbreviations for botanical authors.)

Bibliographic Citations

Bridson, G. D. R. and E. R. Smith. 1991. Botanico-Periodicum-Huntianum/Supplementum Pittsburgh, Hunt Institute for Botanical Documentation. 1068 pp. (Supplement to 1968 Edition.)

Lawrence, G. H. M., et al., Eds. 1968. Botanico-Periodicum-Huntianum. Pittsburgh: Hunt Botanical Library. 1063 pp. (Abbreviations for titles of periodicals.)

Stafleu, F. A. and R. S. Cowan. 1976+. Taxonomic Literature, 2nd Ed. Vols. 1-7. Utrecht: Bohn, Scheltema & Holkema. (Abbreviations for titles of books.)

Data Exchange

Dallwitz, M. J. and T. A. Paine. 1986. User's Guide to the DELTA System, pp. 3-6. Canberra: CSIRO Division of Entomology Report No. 13. (TDWG has endorsed the DELTA format for recording and exchanging descriptive data. Several suites of identification and description-writing programs use this format.)

Standards in Preparation

Data Exchange

TDWG Subgroup seeking an accessions exchange format for specimen data. Contact the convener, Jim Beach, through the TDWG Secretariat.

XDF. A Language for the Definition and Exchange of Biological Data Sets. (TDWG has adopted this standard prepared by Bob Allkin, Royal Botanic Garden, Kew, and Richard White, University of Southampton working with a TDWG Subgroup. XDF is a data definition language that can serve as a medium for defining transfer formats for use between databases with incompatible formats.)

Economic Use Descriptors

TDWG Subgroup seeking a simple system of wide applicability to categorize the economic uses of plants. Contact the convener, Frances Cook, through the TDWG Secretariat.

Habitat, Soil and Landscape Descriptors

TDWG Subgroup seeking a simple system that can be used worldwide to categorize the habitat, soil type and landscape in which a plant occurs. Contact the convener, Mike Lock, through the TDWG Secretariat.

Life-form Descriptors

TDWG Subgroup attempting to identify a small set of universal descriptors that can be applied to the life-forms of plants. Contact the convener, Richard Pankhurst, through the TDWG Secretariat.

Names of Taxa

Names in Botanical Databases. (TDWG has adopted this standard prepared by Frank Bisby, University of Southampton, working with a TDWG Subgroup. It defines a minimum set of plant name fields needed to specify plants precisely.)

Plant Occurrence Descriptors

Plant Occurrence and Status Scheme (POSS). (TDWG has adopted the standard prepared by Christine Leon, Duncan Mackinder, Peter Rooney and Hugh Synge, at the World Conservation Monitoring Centre, working with a TDWG subgroup. It provides a scheme for recording the status of a plant in an area.)

The next annual meeting of TDWG will take place November 7-9 in Xalapa, Mexico. For more information, or to receive registration material, please contact:

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5.21 WORLD RESOURCES INSTITUTE
BIODIVERSITY AFTER THE EARTH SUMMIT
PROSPECTS FOR THE CONVENTION ON BIOLOGICAL DIVERSITY

Kenton Miller and Charles Barber <notes@igc.org>
From: IGC Conservation Biology Desk <consdesk@igc.apc.org>

The United Nations Conference on Environment and Development (UNCED) resulted in a number of agreements concerning biodiversity, the most important being the Convention on Biological Diversity signed by some 153 governments in Rio.

The diplomatic and media attention given to the refusal of the United States to sign the Biodiversity convention also had an important symbolic effect. Biodiversity is now firmly on the international agenda at the political level, and journalists are now familiarized with the issue. It remains to be seen, however, whether the momentum gained at Rio can be sustained by on-the-ground action to save, study, and sustainably use biodiversity in the coming decade and beyond.

Although qualified throughout with phrases like, "as far as possible and appropriate," the Biodiversity Convention commits Parties to take substantive action in many key areas, including:

- development of national plans, strategies, or programmes for the conservation and sustainable use of biodiversity;
- inventory and monitoring of components of biodiversity and of processes adversely impacting it;
- development and strengthening of in situ mechanisms for biodiversity conservation both within and outside of protected areas;
- development of ex situ mechanisms for biodiversity conservation as a complement to in situ approaches
- restoration of degraded ecosystems and recovery of endangered species;
- regulation of the release of genetically modified organisms;
- preservation and maintenance of indigenous and local systems of biological resource management and equitable sharing of benefits with local communities;
- promotion of research, training and public awareness;
- assessment of impacts on biodiversity of proposed projects, programmes and policies;

The extent to which these commitments will lead to concrete action is unclear, and as Maurice Strong, UNCED's Secretary-General, noted at a press conference on June 14, 1992, it is up to all of us in our respective countries to hold our government's feet to the fire on the commitments they made in Rio. Nonetheless, there is clearly a good deal of substance here with which governments can move forward, and considerable leverage that citizens and non-governmental organisations can use to pressure their governments for action.

There are also a number of weak and/or controversial points in the convention which will need attention in the immediate future, for instance:

- The provisions on intellectual property rights and the transfer of technology are exceptionally confusing, and several industrial countries have expressed their discomfort with these sections, while one - the United States - refused to sign the convention on the grounds that the property rights of biotechnology companies (and their patented technological processes) would be compromised and the growth of that industry stunted. Sorting out this complex and contentious issue is a high priority for the Signatories and others, and it may well require a separately-negotiated Protocol, a possibility which has been provided for in the Convention.

- The Global Environmental Facility (GEF) - once fully restructured - has been designated as the interim funding mechanism for the Convention until such time as the Conference of Parties establishes a permanent mechanism. Concern is high about the governance of the GEF (which is managed by the World bank, UNDP and UNEP), the extent to which the GEF is open to public participation (not to mention the real power any such participation will have), and the competence of the GEF mechanism to move large amounts of funding into useful activities. Thus, the GEF is likely to be central to the debates on the financing of the Convention's activities for some time to come.

- Policy and institutional issues that the Global Biodiversity Strategy (launched by the World Conservation Union (IUCN), the World Resources Institute (WRI) and UNEP in February, 1992) identifies as key for conserving biodiversity - such as land reform, indigenous and land rights, empowerment of local communities, abandonment of incentives unfavourable to biodiversity, and a real effort to reduce Third World Debt - were treated weakly or not at all in the Convention.

- The Convention is, in the final analysis, an agreement between national governments, largely excluding non-governmental organisations, the private business sector, local communities and the rest of a wide range of actors who must be involved in conserving biodiversity in the 1990s and beyond.

At the May, 1992 meeting in Nairobi which concluded work on the Convention's text, the Intergovernmental Negotiating Committee (INC) working on biodiversity adopted several Resolutions relating to "interim arrangements" - steps to be taken by signatories and intergovernmental bodies in the period between signature of the convention and its ratification and entry into force. The designation of a restructured GEF as the interim financial mechanism was noted above.

Another Resolution "invites the UNEP Governing Council to consider requesting the Executive Director of UNEP to convene, starting in 1993, meetings of an Intergovernmental Committee on the Convention on Biological Diversity (ICBD)." Some of the functions envisioned for the ICBD are to:

- Advise on country studies that will support the preparation of national plans and strategies, and identify means to support such studies, particularly in developing countries;

- Develop policy guidance, identify strategy and programme priorities, as well as specify criteria and guidelines for eligibility for financial resources; monitor and evaluate the use of those resources;

- Through UNEP as an interim secretariat, cooperate with secretariats of other related conventions and organisations;

- Begin work on an agenda for scientific and technological research on the conservation of biological diversity and the sustainable use of its components; establish the possibility of interim institutional arrangements for scientific cooperation among governments to implement the provisions of the Convention before it has actually entered into force.

The significance of the call for these "interim measures" lies in the governments' recognition that action to conserve biodiversity cannot wait for what may be a lengthy process of ratification by the 30 countries necessary to bring the Convention into force. Governments must also now be made to realize that a wider range of actions and actors must be mobilized to support, guide and complement the framework provided by the Convention.

Dr. Kenton R. Miller is Director of the Programme in Biological Resources and Institutions at the World Resources Institute (WRI), and Coordinator of the Global Biodiversity Strategy Programme.

Dr. Charles V. Barber is an Associate in the Programme in Biological Resources and Institutions at WRI. Both were principal writers of the WRI/IUCN/UNEP Global Biodiversity Strategy (1992)

EDITOR'S NOTE: This month Northern experts review the Conventions signed at UNCED. Next month, the Network will ask Southern experts to review these same conventions.

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The Centre For Our Common Future is a charitable foundation that works as a focal point for follow-up activities on the report of the World Commission on Environment and Development (WCED). The Centre's principal funçtions are to assist the WCED report (entitled "Our Common Future") in taking its appropriate place as an agenda for national and international action and to help catalyze a global movement for sustainable development.

Executive Director: Warren H. Lindner Assistant Executive Director: Rachel Kyte Information Director: Ellen Permato

The IFC is a committee composed of 25 individuals from the various independent sectors of society (i.e. development and environment NGOs, grassroots movements, women's organizations, youth groups, the media, indigenous peoples, scientific unions, trade unions, industry, religious and interfaith communities, etc.) who work within their sectors to facilitate the input of their diverse constituencies into the Earth Summit. The IFC seeks to: assist and organizations and networks of independent sectors to define their roles vis a vis

UNCED on request; to promote fair and effective participation in UNCED on behalf of the independent sectors; to provide a forum for dialogue amongst the independent sectors; to undertake such programmes or activities aimed at strengthening the capacity of the independent sectors to work globally on issues of sustainable development. The IFC welcomes their participation in its network.

Chairman: Ashok Khosla Director: Jose Sotto

(ref.: commonfuture@gn.apc.org in en.unced.news Network '92 #18)

5.22 AVIAN DATABASE

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Conservation Priorities in the Brasilian Amazon - Avian Database.

The purpose of this project is to acquire and store information on distributions, population sizes, and conservation status of endemic, rare or endangered species of birds in the Brasilian Amazon.

The project is conducted by Fundacao Pro-Natureza (A Brasilia-based NGO), the Center for Research and Conservation of Wild Birds (connected to IBAMA, the Brasilian Environment Agency), and the University of Brasilia's Department of Ecology, with support of the National Environment Fund (FNMA).

Initial uses of the database have been in identifying species and regions not protected in the existing reserve system, listing reserves in need of general avian surveys, and identifying reserves which are likely to contain endemic and rare taxa.

The database is currently being upgraded to make information available to scientists, conservationists, government agencies, and the public.

We are considering a microcomputer-based dial-up bulletin board, or a bitnet LISTSERV list. We would appreciate your suggestions on other alternatives, and would like to collaborate in the Biodiversity Network scheme.

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5.23 BEYOND HOTSPOTS: ASSESSING NEW APPROACHES TO SETTING PRIORITIES FOR THE CONSERVATION OF BIODIVERSITY

MINUTES OF IUCN-SPONSORED WORKSHOP: 20 JUNE, 1992, NATURAL HISTORY MUSEUM, LONDON

Contributed by Colin Bibby, ACBP

In conjunction with a conference on Systematics and Conservation Evaluation held at the Natural History Museum in London in June 1992, the Species Survival Commission, the Commission on National Parks and Protected Areas, and the Commission on Ecology of IUCN-- the World Conservation Union, held a one day workshop to assess new approaches to setting priorities for the conservation of biodiversity. The workshop built upon presentations and discussions at the Systematics and Conservation Evaluation Conference to explore how recent advances in using systematics for conservation planning could help guide investments in biodiversity conservation by international donor organizations and non-governmental organizations. Participants at the workshop included representatives from the IUCN Secretariat, government agencies, non- governmental organizations, museums, and academic institutions from around the world.

In introductory discussions, the workshop participants agreed that it was an appropriate and important time for a discussion of the steps needed to improve our state of knowledge for setting biodiversity conservation priorities. It was hoped that the outputs of the meeting would be some ideas on how to develop institutions to address this task and how to build linkages between them. There is a great need for more alliances, as work in this field to date has been fragmented. Discussions at the conference preceding the workshop indicated that the systematics community needs to learn how to improve their means of presenting information to decision-makers and needs to build more bridges with the conservation community. It is clear that many questions exist regarding the scale at which data should be collected and held.

The IUCN workshop, chaired by Colin Bibby of ICBP, included a series of brief introductory comments from some of the participants laying out major themes and issues to be addressed during the day. Following these presentations, the meeting split into several working groups exploring questions rising from the preliminary presentations. These minutes present summaries of the preliminary remarks and the outputs from the working groups.

George Rabb, Chair, Species Survival Commission introductory comments:

The SSC has long been concerned with setting priorities for conservation of biodiversity. Though it has often been done with a motley array of information and information compilers. The ad- hoc assembly of the SSC has limited its ability to address the conservation of biodiversity as a whole as opposed to focusing on groups of species. The SSC has had traditional strength in using small population biology to assess categorization of threat to species. This enables a rough assessment of status, and a re- ordering of priorities for conservation on the basis of actual threats, particularly with recommendations for ex-situ conservation. There is a need for a similar effort and capability for setting priorities for conservation of sites. Recent interest in this approach is stimulated by multi-factorial views on elements of biodiversity. We have a great opportunity for doing more now, because of funding from the Global Environment Factility, and other initiatives following UNCED.

Keith Brown, preliminary comments:

In thinking about setting priorities, we need to learn from others who have been direct stewards of the resources. There are lessons to be learned from Brazil where scientists found that they often were asking the wrong questions and using the wrong techniques. They key is to utilize traditional knowledge in setting priorities to avoid making the same mistakes over again. In addressing these issues, we need to practice humility and compassion instead of sophistication, presumption, and objectivity. This will allow us to develop the new alliances that are really needed.

Jeff McNeely, IUCN, preliminary comments:

The business of conservation involves setting priorities all the time. Beyond setting priorities for conservation action, we need to figure out how to use our tools to reverse or prevent expenditures and actions that deplete biodiversity. Governments are now willing to accept that biodiversity should be conserved without knowing exactly what this means. At different levels, conserving biodiversity means different things. Conservation of biodiversity at the global level is the key, because at the local level you can have increasing biodiversity while the contribution of that area to global biodiversity is going down (e.g. Hawaii). A key question is how to extrapolate global priorities to the local level. Scientists should be cognizant of what managers need. For example, park managers want a bigger budget for their park. Can scientists help them get a bigger budget. Priorities must not be set in isolation. We should not just tell managers what the priorities are, but should give the managers the tools to decide their own priorities. A lesson from the Parks Congress is that we should not just be concerned about genes or sites, but about the institutions necessary to protect them. How can we translate priority setting-information into a format that existing institutions can use.

Ralph Cobham, CNPPA, preliminary comments:

The challenge post-UNCED is how to get the best "value" for big investments in protected areas. We need to ask what tools do we need to develop to inform decisions about investments at various levels. This is hard to do at the global level, because we will often get it wrong for what people want at the local level. There are various criteria for setting priorities and they will vary depending on who is setting them. The broad groups of criteria are: economic/socio-political; biological; and cultural. A question exists as to whether we should try to collapse these into a single tighter set for politicians to use.

Barry Richardson, Univ. of Western Sydney, preliminary comments:

Practical information is needed to make decisions about priorities for conservation. Yet the data sets needed often do not exist and we still need to make decisions. Thus there is a need for improved methods of making predictions about those data that we think are important that we do not have. We must provide information to decision-makers in a form they understand and use technology to assist them in understanding what is going on. Use and manipulation of GIS is an example of a way to make technology real and usable at the decision-making level. We need to continue to improve the quality of the methods we use. We should take advantage of existing data-sets, such as digital terrain models used by the military. IUCN should be pushing to make these sorts of tools available. We must also challenge the Australians to make their technology available to the rest of the world.

Tim Johnson, World Conservation Monitoring Centre, preliminary comments:

What we want is a quantum leap in the information available on species and we should avoid a defeatist attitude and set high targets. At all levels, we could be doing a better job. There are three identifiable constraints to doing more at this stage:

1) potential users are unaware of the extent of information that is already available.

2) much of the existing knowledge that could be used does not exist in an accessible format. We need to take knowledge out of people's heads and put it in form that others can use. We should not wait for knowledge to be perfect, we should get it out there and by using it continue to refine and improve it.

3) there are some things we do not know yet and we need long-term research.

Required information on species is of three types: what (lists), where (maps, distribution), and how (conservation status). Global lists of names are important, but more important is the development of standard taxonomies. We should be putting our best knowledge (even if not perfect) in front of decision-makers and we should use short-cuts to get this information out. And we need to do a better job of assessment of status of species. Some important questions: How do we improve the coordination of delivery of information?; How can we deliver existing knowledge (especially when it is still in people's head) in a useable format to those needing to use it? What should our priorities be for future monitoring and research (i.e. what will people want to know in 20 years?)

Melanie Stiassny, American Museum of Natural History, preliminary comments:

Fifty percent of all vertebrates are fish. They are key species in key areas, yet they are often given much less attention in setting priorities for biodiversity conservation. There is a need to include more freshwater faunas in inventories and surveys. There is already a good deal of information available on fishes (e.g. the distributions of all African freshwater fish). It has just not been used effectively in setting priorities.

Dick Vane-Wright, Natural History Museum, London preliminary comments:

A key question is whether taxon richness is a sufficient basis for setting priorities for conservation for biodiversity. There is certainly also a need to consider complementarity and efficiency at some level and to be concerned with taxonomic distinctiveness. Unfortunately, we do not have all the data we need to use these tools completely, but we should make as much use of them as possible while the available data are improved. Other measures, such as landform/ecosystem measures, exist, but while appropriate on a local level, are problematic for setting priorities at a global level.

An important quesation to resolve is what data management systems are needed. In the short-term, life-lists and general information on location are needed. In the long-term, much better information about distribution will be needed. Managers need to say what kinds of outputs they need to set priorities for action and managment. Both data managers and land managers need to say what data they need from scientists and scientists need to say what they are capable of providing. Taxonomists may be able to say what information is already available, but it is difficult for them to disseminate this information. It ends up in obscure books on a few shelves. There is a need for a revolution in data management in terms of getting the information into the hands of the people who will use it.

George Rabb additional preliminary comments:

Our basic goal is to insure that we are conserving as much biodiversity as possible. At the same time, we must strive to conserve ecologically and economically important elements of biodiversity. Unfortunately, there is a scarcity of resources available for this task. We need more people involved in the effort (although could address this shortfall to a a degree by mobilizing local knowledge). There is a great need for institutional capacity building, particularly at local and regional levels. There is a need for greater information flow and a related need for resolving questions of scale. In addition to being concerned about lack of resources, we need to know what the users need in terms of what we can make available. We should systematically examine existing institutions and how they perceive and use taxonomic information. The bottom line for resources, is that they are not getting to "enabling efforts"--projects that will make overall efforts to conserve biodiversity better. Major funding institutions need to realize the value of these general enabling efforts and direct more resources toward them.

The working groups addressed 5 basic questions and came up with the following responses:

1. What are some basic principles for setting priorities for conservation of biodiversity:

- keep the users in mind
- priorities will vary depending on scale and purpose
- priorities should allow flexibility in being met to conform with constraints of resources and non-biological factors
- do not just focus on protected areas
- consider different values of biodiversity in setting priorities
- any information about priorities must be as widely available and as "good" as possible
- must consider the utility of systems and species in setting priorities
- observe principle of complementarity
- priorities should aim toward maximum efficiency of use of conservation resources
- preserving diversity and wide taxonomic breadth maximizes options for the future
- need to incorporate some level of representativeness
- priorities should encompass irreplaceable elements of biodiversity
- consider levels of threat, vulnerability, and viability
- when possible, incorporate some redundancy into priority setting.

2. What information is needed to respond to these principles?

- standard biogeographical classifications to serve as a framework for collecting further information
- information on types of land-use and land tenure
- a better understanding of what is already protected including maps
- a description of what is available for further protection
- evaluation of the current state of systems to serve as base-line monitoring
- names of species, collated and accessible "life-lists"
- data on the status of species and systems
- historical information on distribution
- an assessment of the value of species (to ecosystems, humans, etc) incorporated in databases
- more information on what species can act as surrogates for indicating how to protect large systems

- information about the relations between species: both ecological and phylogenetic relationships
- understanding of functional redundancy in systems
- methods to infer distribution of species
- a central key to existing databases
- better use of existing local knowledge

3. What tools need to be developed to be used by decision-makers?

- need to have dialogue with decision-makers and other users of data
- incorporation of biodiversity in environmental impact assessments
- need to "re-patriate" the raw data for local decision-makers
- need translators of science into policy and vice versa
- need improved explicit procedures for developing priorities: data collection data analysis data modelling - Both rule based and expert systems
- improved quality and quantity of available information in the proper format: make data available; identify the gaps in the data; fill the gaps in the data
- turn gadgets into products
- standard taxonomies and standard exchange formats to help share data
- focus on where benefits accrue in use of data and a mechanism to ensure proper accrual of benefits.
- more participatory research (with in-country researchers?)
- local institutions (museums) need support to be more effective
- need effective training programs and trained people
- education of the public to build support for efforts

4. How should information needed for setting priorities be presented and disseminated?

- coordinate activities to inform future decisions.
- build networks (electronic and paper)
- international coordination of dissemination
- stimulate flow of information between local and global sources in both directions
- need a global database for collecting information
- new ways of dissemination using computers
- transmit in electronic format where possible to avoid need for re-entry
- Maps/ GIS
- distribute tools like WORLDMAP
- procedures manuals
- better synthesize existing available information
- subsidize distribution of publications
- develop early warning systems

5. What practical initiatives can IUCN/others take towards informing major investment decisions on setting conservation priorities?

* Establish an IUCN working group, bringing other parties together, to work on coordinating international efforts to prioritize biodiversity conservation. Identify and co-opt other players in this arena.

* Build a coalition of organizations for lobbying purposes

* Set up a program to facilitate information flow, to gather and combine relevant data-sets.

* Develop an effective international coordination effort, particularly to work with the Convention on Biodiversity

* Use the SSC network to produce information on distribution and taxonomy - particularly on biodiversity indices.

* Undertake a major effort to map species in GIS ($8 million over 5 years)

* Improve our basic information base by:
  - mapping vegetation
  - conducting floristic and faunistic inventories
  - inventory protected areas
  - computerize the data holdings of major taxonomic institutions (museums, herbaria): cost $100 million over 3 years

* Produce world life-lists (taxonomic lists) with appropriate exchange standards.

* Invest in taxonomic research, global monitoring, and educating local constituencies.

* Map crop genetic resources in the wild

* Improve decision-making by:
  - developing decision tools (analytical packages)
  - identify surrogates and testing them
  - developing and testing models

* Support a strong educational initiative
  - train staff in local areas
  - more public education on biodiversity

* Establish national/regional biodiversity centers to serve as training centers and a network for holding information. Need manual and workshops to establish them (cost $40 million per center)

* Develop investment guideline, based on above information

* Work to incorporate biodiversity in environmental impact assessments

Concluding discussion

There was a consensus from the meeting that there is a need for continued coordination of efforts around biodiversity conservation priority setting. IUCN was suggested as a logical convener of an effort to keep up the dialogue with the players represented at this meeting and to bring in other key players such as World Resources Institute and IUBS. IUCN should use this forum to lobby major funding agencies to put more resources into the needs identified by participants at the workshop.

5.24

TROPINET
Vol. 3., No. 2, Summer 1992

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Tropinet is published quarterly by the Association for Tropical Biology; the Organization for Tropical Studies and the National Museum of Natural History, Smithsonian Institution, U.S.A..

ATB is an international society that promotes tropical biology in its broadest sense. ATB publishes the quarterly journal Biotropica and sponsors frequent symposia. Information: J.S. Denslow, Dept. of EEOB, Tulane University, New Orleans, LA 70118 USA.

OTS is a non-profit consortium of 52 academic and research institutions in the US, Costa Rica and Puerto Rico. Its mission is to provide leadership in education, research and the wise use of natural resources in the tropics. Graduate training and research facilities are provided at three field station in Costa Rica. Information: D.E. Stone, OTS, P.O. Box DM, Duke Station, Durham, NC 27706 USA.

The Office of Biodiversity Program in the National Museum of Natural History, Smithsonian Institution, coordinates training and research programs in tropical biology in a number of countries. Information: D.E. Wilson, MRC 106, Smithsonian Institution, Washington, D.C. 20560 USA.

Tropinet is distributed to members of ATB and associates of OTS at no extra charge. Subscriptions for others are US $5/year, $9/two years, $12/three years; multiyear subscriptions are encouraged. Send name, address and check or money order to: J. Giles, OTS, P.O. Box DM, Duke Station, Durham, NC 27706.

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EDITORIAL

By Meg Lowman, Biology Dept., Williams College, Williamstown MA 01267 USA, Tel. 413-597-3314, FAX 413-597- 4116.

Canopy Research: An Invitation. Many of our ecological ideas have been developed in temperate regions and then transplanted to tropical systems - sometimes with disastrous consequences. One notable exception to the temperate-to- tropical migratory flow of ideas is forest canopy research. Many aspects of this innovative field have been pioneered in tropical rain forests and then transplanted to temperate forests. The reasons are perhaps obvious - most of the organisms and interactions in rain forests are high above ground-level. Most of the spatial area, photosynthetic tissue, and biodiversity in rainforests exists at heights of 25-50 m. Methods of canopy access have been initially described for tropical forests and

in tropical journals, and much of what is known about canopy ecology stems from the tropics.

The first official get-together of canopy researchers will occur this year in Honolulu during the AIBS conference. ATB is sponsoring a session entitled "Rain Forest Canopy Research: New World - Old World Comparisons." Although few biologists have actually worked on forest canopies in both the Old and New World tropics, the symposium topic is intended to stimulate discussion of ideas and research from both sides of the world. There will also be a brainstorming session to discuss techniques for accessing canopies: ropes to walkways to cranes to dirigibles to towers. A master list of canopy researchers is being collated in conjunction with this symposium. Please send me your name and area of research if you wish to be contacted for a future, larger- scale conference.

As a tropical biologist who has worked extensively in rain forest canopies, I recently returned to the temperate zone for employment. One of the questions that my students most often ask is: how do the dynamics of tropical forest canopies compare with their temperate counterparts? To make this comparison, I constructed a walkway in a deciduous forest in northwestern Massachusetts. My students and I are currently engaged in research on the dynamics of leaf growth, insect population biology, and herbivory in oak and maple canopies. I invite biologists interested in canopy research to visit our walkway and to use it as a prototype for construction at another site. This technique of access is relatively inexpensive and has become an important research and educational tool for my biology classes.

ASIA

NORINDRA. The field year of the Norwegian Indonesian Rain Forest and Resource Management Project (NORINDRA) has just been completed. The aim was to promote sustainable utilization and conservation of rain forest resources through integrated ecological and socio-economic research. The area studied was centered on the Tigapuluh Hills of Indragiri, Riau, in central Sumatra. The forests here are very rich and the humans in and around them comprise tribal Talang Mamak and Kubu, other 'Malays', and Javanese transmigrants. The 43 Indonesian, 15 Scandinavian and three British participants have worked on a basic inventory and analysis of physical and biotic resources, and the major sectoral systems of resource use (agriculture, logging, conservation). Currently the team is integrating the information to provide evaluations of different scenarios of future resource management. A proposal to gazette the forest area as a reserve was prepared that will require the Ministry of Forestry not to renew a major logging concession license this year. Final results from the project are expected by mid-1993. Information: Dr. O. Sandbukt, Center for Development and Environment, Univ. of Oslo, Norway.-- A.J. Whitten, Jl. Mertasari 10 Br. Blanjong, Sanur 80228, Bali, Indonesia, Tel./FAX 62-0361-88633.

Ecology of Indonesia Series. The Canadian International Development Agency (CIDA) through its successful Environmental Management Development Project (EMDI), Phase 3, is funding the preparation of the final volumes of the Ecology of Indonesia series: The Ecology of Kalimantan (Borneo) (by K. MacKinnon et al.), The Ecology of Java and Bali (A.J. Whitten et al.), The Ecology of the Moluccas and Lesser Sundas (K. Monk et al.) and the Ecology of Irian Jaya (A. Forsyth et al., with funding from Conservation International). The Ecology of Sumatra (2nd. ed.) and The Ecology of Sulawesi were published in 1987, also with CIDA funding. Information: Ir. Ani Kartikasari, Publications Coordinator, EMDI, Arthaloka Building, Jl. Sudirman No. 2, Jakarta, Indonesia.--A.J. Whitten (address above).

Conference on Sustainable Forestry. This symposium will be held at Holiday Inn City Centre, Kuala Lumpur, Malaysia, 5-9 October 1992. The objectives are to promote better understanding and awareness among foresters, managers, engineers, and other professionals regarding the most appropriate silvicultural and logging techniques to maximize timber output and minimize environmental hazards; to review and discuss plantation and natural forests management in the tropics; and to assess cost-effective technologies for harvesting operations in plantation and natural forests. Information: The Secretary, Harvesting & Silviculture for Sustainable Forestry in the Tropics, c/o Forest Research Institute Malaysia, Kepong, 52109 Kuala Lumpur, Malaysia, Tel. 03-6342633, FAX 603-6367753.

AUSTRALIA AND PACIFIC BASIN

43rd AIBS Annual Meeting. The Annual Meeting of AIBS will take place in Honolulu, Hawaii, 9-13 August 1992. Symposia of particular interest to tropical biologists were listed in the previous issues of Tropinet. Information on registration, field trips, workshops, hotel reservations, and travel arrangements: AIBS, 730 11th St. N.W., Washington, DC 20001-4521, Tel. 800-992-2427. Program information: K.C. Ewel, ESA Program Chair, Dept. of Forestry, Univ. of Florida, Gainsville, FL 32611-0303 USA, Tel. 904-392-4851, Email kcewel@nervm.nerdc.ufl.edu.

Mountain Cloud Forest Meeting. A symposium/workshop focussing on the hydrological and biological functions of mountain cloud forests is proposed for April 4-8, 1993. A state-of-knowledge synthesis will be attempted, threats to these valuable ecosystems will be assessed, and a program to protect them will be proposed. Managers and researchers who work in mountain cloud forests and have a broad interest in their conservation, particularly those from tropical developing countries, are invited to apply. The meeting will be held on the island of Hawaii and is being organized by the East-West Center, Environment and Policy Institute. Co- sponsors are the IUCN Tropical Forests and Mountain Programmes and Univ. of Hawaii, Hilo; the International Mountain Society is a collaborating institution. For purposes of this meeting, cloud forests will include vegetation types with local names such as bosque de ceja, elfin and mossy forest, gebirgs-nebelwald, forest firth, selva nublada and areas where persistent wind driven clouds or fog. Send letter of interest and a brief summary of your cloud forest work to: Dr. L. S. Hamilton, EAPI, East-West Center, 1777 East-West Road, Honolulu, HI 96848 USA.

Conservation And Environment in Papua New Guinea. The proceedings have just been published of a symposium on establishing research priorities for conservation of Papua New Guinea's biological and cultural diversity, held June 3, 1991 at the East-West Center, Hawaii. Edited by M. Pearl, B. Beehler, A. Allison, and M. Taylor, the volume has contributions from 17 authors from Papua New Guinea, New Zealand, Australia, and the U.S. It is available from Dr. M. Pearl, Asia/Pacific Program, Wildlife Conservation International, Bronx, NY 10460, and Ambassador M. Taylor, Embassy of Papua New Guinea, 1615 New Hampshire Ave., NW, Washington, DC 20009. The editors suggest a donation of US $30 or 30 PNG Kina (make checks payable to the Wildlife Conservation International PNG Student Fund); proceeds will support Papua New Guinean student conservation research projects.--M. Pearl.

EUROPE

European Science Foundation. In September 1991, ESF established a working group for implementation of an ESF program on Tropical Biodiversity. The working group, led by Prof. Dr. K. E. Linsenmair (Univ. of Wurzburg, FRG), formulated a 5 year program, now

being submitted for approval and funding. Information: Dr. N. Petersen, ESF, Strasbourg, France, FAX 33-88-37-05-32.

LATIN AMERICA

ATB 30th Anniversary Meeting in Puerto Rico: Thirty Years of Tropical Biology Research: From Organisms to Global Change. ATB will celebrate its 30th anniversary with a meeting in San Juan, Puerto Rico, 1-4 June 1993; the Institute of Tropical Forestry (USDA Forest Service) will co-host. An exciting mix of symposia, poster and contributed paper sessions, field trips and gala anniversary bash is planned. Proposals for symposia are welcome. Information: Dr. J. Ackerman, Dept. of Biology, Univ. of Puerto Rico, Rio Piedras, P.R. 00931. Tel. 809-764-0000 ext. 2569; FAX 809-724-2610.

Third International Botanic Gardens Conservation Congress: Botanic Gardens in a Changing World. The Botanic Gardens Conservation Secretariat (BGCS) will host the Third Congress in Rio de Janeiro, Brazil, 19-23 October 1992. The objective is to review the continued progress and involvement of botanic gardens worldwide in the implementation of the World Conservation Strategy and in their response to the challenges posed by global change. Delegates will discuss issues that challenge botanic gardens in developing conservation programs, plans to preserve endangered biodiversity, and work strengthening their institutions for these tasks. The proceedings be published. Sessions will be: Botanic gardens and their response to global change, Plant re-introduction, Practical horticulture, Plant documentation and records, In situ conservation, and the Role of botanical gardens in education and environmental awareness. Information: J. Willison, Botanic Gardens Conservation International, Descanso House, 199 Kew Road, Richmond, Surrey TW9 3BW, U.K.

Seminar on Tropical Mountain Ecosystems. An International Seminar was held from December 9-15, 1991, at the Univ. of Cauca at Popayan, Colombia. Some 180 delegates from 14 different countries attended, presenting results of studies on global change, ecological transects, ecological processes, management, conservation, and biodiversity. A resolution was unanimously passed supporting the creation of the "Transecto Ecuatorial Pacifico-Amazonico (TEPA) in southern Colombia, Northern Ecuador, and Amazonian Peru. This area is the most important mega-diversity area in America and includes: superhumid Choco rain forest, humid and dry types of mountain (cloud) forest, paramo, and the westernmost humid part of the Amazon basin. A printed seminar document (in English and Spanish) on the Andean biodiversity of Colombia was prepared by H. van Velzen and is available for US $10 (printing and handling) from Dr. A. J. Negret, Museo de Historia Natural, Popayan, Colombia or Dr. A. M. Cleef, Hugo de Vries Laboratory, Univ. of Amsterdam, Kruislaan 318, 1098 SM, Amsterdam, The Netherlands, Tel. 31-20-5257840, FAX 31-20-5257715.--A.M. Cleef

Second International Symposium on Environmental Studies of Tropical Rainforests-Forest '92. Held in Rio de Janeiro, 24-29 May, the meeting follows up on FOREST '90, held in Manaus in October 1990. The main objectives of the meeting were to inform governmental authorities and the public of the present state of knowledge of tropical rainforests and their resources (wood and non-wood products); alternatives for their development, management and conservation, with full participation of local populations; and the maintenance of optimal levels of biodiversity. The meeting produced guidelines and recommendations for use by research and educational institutions, governments, and development institutions on tropical rainforest use and conservation. Information: Organizing Committee of FOREST '92 and ECO- URBS '92, P.O Box 3591, 20001 Rio de Janeiro, RJ Brazil, Tel. 0055-21-521-7896, FAX 0055-21-262-5946.

Tropical American Rabbit Project. Few studies have been conducted on tropical American lagomorphs, although they are rather common throughout their range. Data and publications concerning Sylvilagus brasiliensis and S. floridanus would be greatly appreciated. Information is also requested on the guinea pig (Cavia porcellus).--A. Velazquez Montes, Hugo de Vries Laboratory, Univ. of Amsterdam, Kruislaan 318, 1098 SM, Amsterdam, The Netherlands, Tel. 31-20-5257840, FAX 31- 20-5257715.

Erratum Available. In printing the book Ant-Plant Interactions (C.R. Huxley and D.F. Cutler, eds. Oxford Science Publications), corrections requested in proof were missed in the appendix to the chapter by E.W. Schupp and D.H. Feener (Phylogeny, lifeform, and habitat dependence of ant-defended plants in a Panamanian forest). As a result, the appendix contains critical errors in scientific names and in the lifeform and habitat classifications used in analyses. Oxford Univ. Press has now reprinted the appendix. If you purchased the book and wish a corrected copy of the appendix, contact E.W. Schupp, Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29802 USA.

Pleistocene Refuges. Biological information on Pleistocene refuges on the Amazonian Ecuador-Peru border is requested for a proposal for a binational park. The park is being developed by Fundacion Natura, Ecuador and Proterra, Peru. The area being considered is a high biodiversity zone in SE Ecuador and NE Peru. References and information on this area will be greatly appreciated. Fundacion Natura, Att'n Programa de Conservacion 17-001-253, Quito, Ecuador, email root@natura.ec.

Native Trees in Brazil. The II National Congress of Native Trees was held in Sao Paulo, Brazil, March 29-April 3 1992. 1200 researchers from many Brazilian institutions and universities met and discussed aspects of biodiversity and sociodiversity, as well as international and economic strategies for conservation of Brazilian native forests. Several themes were strongly debated, such as social responsibilities, mega-forests, GATT, and UNCED-92. A session on the Atlantic Forest was particularly well attended. The proceedings of this meeting will be published as Annals of the II National Congress of Native Trees. Information: O. Barbosa, Instituto Florestal, Secretaria do Medio Ambiente, C.P. 1322, CEP 01059, Sao Paulo, SP Brazil.- -J.N. Nakajima, Dept. de Biociencias, Univ. Federal de Uberlandia, Kleber del Claro, Centro de Biomedicas, Bloco 2D, Campus JD, Umuarama, CP 593, Uberlandia, Minas Gerais, C.E.P. 38.400, Brazil, Tel. 034-212-2111, email DEBIO02@BRUFU.Bitnet.

NORTH AMERICA

Directory of Tropical Forestry Journals and Newsletters. The U.S. Forest Service, Department of Agriculture is compiling a Directory of Tropical Forestry Journals and Newsletters. Information: E. Freed, Forestry Support Program, USDA-Forest Service, 14th and Independence SW, P.O. Box 96090, Washington D.C. 20090-6090, USA.

Neotropical Montane Symposium. Continuing the New York Botanical Garden's (NYBG) centennial celebration, a series of symposia will be initiated in 1993 focusing on plant diversity in the Neotropics. Initial response and interest in a symposium on Neotropical montane forests has been overwhelming. The Institute of Systematic Botany of NYBG and the Botanical Institute of Aarhus Univ. are planning this symposium to be held at NYBG, Bronx, NY, 21-25 June 1993. Primary emphasis will be taxonomic and ecological richness of wet or moist montane forests of the Andean region, and conservation of biodiversity in that area. Speakers will present data on plant families, genera, or vegetation types centered in the neotropical mountains, addressing topics of diversity, speciation, evolution,

distribution, and conservation. A series of overviews, e.g., geology, climate, past and present vegetation, etc., will be included to provide perspective. This discussion is critical if professionals are to make environmentally responsible management decisions. Posters and publications may be displayed, and informal workshops will be held. The planning committee includes J.L. Luteyn (chair), S.P. Churchill and H. Balslev. The proceedings will be peer-reviewed and published. Information: Dr. J.L. Luteyn, Neotropical Montane Forest Symposium 1993, Institute of Systematic Botany, NYBG, Bronx, NY 10458-5126, USA, Tel. 212-220-6504.

Environment and Society. The US National Research Council's (NRC) Board of Agriculture invited representatives of scientific societies to a dialogue on environment and society at the National Academy of Sciences' (NAS) Beckman Center, Irvine, CA, 3-4 April 1992. Rapid changes in agricultural practices, technology and economics are affecting the social fabric of urban as well as rural areas; old norms can no longer meet the demands of these new realities. The dialogue yielded a better understanding of how academic and professional expertise can combine to address environmental and social issues in agriculture. Speakers provided a personal perspective and posed many issues. John Vandermeer (Univ. Michigan) gave a provocative talk: Thoughts on agriculture and the environment in a postmodern world. Small working groups discussed priorities, issues and areas of overall consensus. The group recommended that the NRC conduct a major study of the role of higher education in resolving problems of agriculture, food and society. The study will assess: the nation's research, teaching and extension needs; how universities can be more adaptable to changing social, economic and demographic conditions; how to facilitate relationships among universities and between science and society; and how interdisciplinary scholarship can be enhanced. Information: C. Carlson, Director of Communications, Board on Ariculture, NAS, 2101 Constitution Avenue, NW, Washington DC 20418.--D. Wilson, National Museum of Natural History, Smithsonian Instituiton, Washington DC 20560.

FIELD STATION PROFILE

TREES (Tropical Reforestations Environmental Education Station) provides facilities for research and education on Osa Peninsula, one of the last great lowland forests in Costa Rica and among the richest tropical wet forests left in Central America. The station is located on the Pacific coast on a wide stretch of forested beach which is a prime sea turtle nesting site. Research emphases are on forest and gap dynamics, pollination systems, plant-animal interactions, management of second-growth tropical ecosystems, and tree phenology and reproductive biology. The VERDEA Project is dedicated to forest conservation, community ecology and rainforest resource management strategies. The Osa Cetacean Study (OCS) focuses on understanding the complex water environment that exists adjacent to and as an integral part of Osa's rainforests.

Facilities include a system of canopy platforms in three different mature forest sites. Transportation and access to several research sites, including 400 ha of nearby protected mature forest and Corcovado National Park are provided. Other facilities located in the beach area of the 75 acres owned by TREES are a central building with office, large kitchen and sleeping quarters for four; two adjacent rustic researcher-cabins; solar powered radio communications and computer equipment for data processing (soon available on the canopy platforms). Basic greenhouse and lab facilities, running water, 4WD vehicle, and a 16 foot Zodiac boat are also available.

TREES is represented in the US by Aquatic Resources Conservation Group (ARC), a Washington non-profit corporation, and has received support from Greenpeace, Black

Diamond, Patagonia, Cetacean Society International, Environmental Youth Alliance, and from private donations and memberships. Information: M. Alonso-Martinez, Director, TREES, 3706 SW Hill, Seattle, WA 98126 USA, Tel. 206-932- 3107, FAX 206-634-2796.

ANNOUNCEMENTS Meetings and Events

Items marked * are new in this issue.

1992

*6th Annual Meeting of the Society for Conservation Biology. Blacksburg, VA, June 27-July 1. Information: Dr. G. Cross, Dept. of Fisheries & Wildlife, VPI & SU, Blacksburg, VA 24061-0231 USA, Tel. 703-231-8844.

*The Natural History Museum and The Linnean Society Joint Meeting: Phylogenetic Approaches to Ecological Problems. London, UK, 1-2 September. Information: Executive Secretary, The Linnean Society, Burlington House, Picadilly, London W1V OLQ, UK.

*Status and Management of Neotropical Migratory Birds. Estes Park, CO, 22-25 September. Information: T. Martin, Arkansas Coop. Fish & Wildlife Unit, Dept. of Biological Sciences, Univ. of Arkansas, Fayetteville, AR 72701 USA.

*6th Meeting of the Society of Human Ecology: Human Ecology-Crossing Boundaries. Snowbird, UT, 2-4 October. Information: S.D. Wright, Univ. of Utah, FCS Dept., 228 AEB, Salt Lake City, UT 84112 USA, Tel. 801-581-8750.

*Computers in Botany, Instituto de Ecologia, Xalapa, Mexico, 3-13 November 1992. Joint meeting of the Taxonomic Database Working Group (TDWG) and International Organization of Plant Information (IOPI); workshops, classes and symposia are planned. Information: L. Giddings, Box 63, Xalapa, Veracruz, 91000 Mexico, FAX 52-281-86809/44697.

Positions

Instructor, Madagascar. The Missouri Botanical Garden seeks applicants for an Instructor in Madagascar. Responsibilities include: develop and implement training programs in Madagascar to familiarize young Malagasy botanists with all phases of field botanical and herbarium techniques, including inventory and quantitative vegetation sampling methods; organize and oversee collecting expeditions, often in difficult conditions; and write progress reports. Applicants must have field experience in the tropics and a good command of French; B.S. in botany or biology required; an M.S. degree is preferred; four to five years field experience in the tropics. The position is available for one year, but may be renewable depending on performance and funding. Applications (letter of interest, curriculum vitae, and names of three references) to: Missouri Botanical Garden, Human Resources Management Division, P.O. Box 266, St. Louis, MO 63166 USA.

Remote Sensing/GIS Specialist. Latin America Science Program, The Nature Conservancy, Arlington, VA. The Remote Sensing/GIS Specialist is responsible for image processing and product preparation required for Rapid Ecological Assessment (REA) and other related activities in Central America. Responsibilities include the use of computer software to process satellite and other images, production of maps and other products, overseeing of hardware, operating system and software maintenance, overflight and field verification and any other duties to support REA. All these duties will be applied principally to the

Environmental Monitoring/Conservation Information component of the Central America-wide PACA (Proyecto Ambiental para Centro America) project. Requires: advanced degree or equivalent experience in geography/cartography; biological science or natural resource field; knowledge and hands-on experience with DOS and UNIX operating systems and image processing/GIS software; working experience in natural resources survey techniques in Latin America; and Spanish language proficiency. Information: C. Sobrevila, Ecologist, Latin America Science Program, The Nature Conservancy, 1815 N. Lynn St., Arlington, VA 22209 USA, Tel. 703-841-5300, FAX 703-841-1283.

Courses

Smithsonian Institution/Man and the Biosphere Program announces two courses: 1) Conservation of Natural Resources and the Management of Wildlands to take place in Ecuador (Quito and the Galapagos), 4-15 June 1992. 2) A second course with the same title will be offered in Bolivia (La Paz, Santa Cruz, and Noel Kempf Mercado Biosphere Reserve), 14 June-5 July 1992. Information: F. Dallmeier, National Museum of Natural History, Smithsonian Instituiton, Washington DC 20560.

International Wildlife Conservation Training Courses. The Smithsonian Institution's (SI) Wildlife Conservation and Management Training Program will conduct five international training courses in 1993. These are designed for scientific and field personnel from government wildlife agencies, non- governmental organizations, and universities in developing countries. Courses are 6-10 weeks in length and will be conducted in Venezuela, Malaysia, China, Tanzania, and the USA at established field sites. Lectures are given concurrently with field training designed to assist the course participants to collect, analyze, and interpret data on habitat, demography, ecology, and behavior of wildlife species. Seminars and workshops on special topics (e.g., captive wildlife management, conservation education, computer applications) are included in many of the courses. In general, trainees should have their own funds for food, travel, and personal expenses, but the SI provides some funds for a few trainees to help defray expenses for food and travel. Applications consist of cover letter with course preference and financial resources available, statement of interest (2-3 pages), curriculum vitae, letter of recommendation from supervisor or head of agency, and two other letters of recommendation. Deadline: 15 Dec. 1992. Information: Dr. R. Rudran, National Zoological Park, Dept. of Zoological Research, Washington DC 20008, Tel. 202-673- 4826, FAX 202-673-4686.

Natural Resources and Peace. The Peace Univ., Costa Rica, offers short training courses taught in Spanish on a variety of natural resources topics. Those offered in 1992: Agroforestry: Sustainable land use for the humid tropics (23 March-11 April), Buffer zone management for protected areas (27 April-16 May),, and Raising the value of non-timber forest products and services for local communities (22 July- 7 August). Information: G. Budowski, Univ. para la Paz, Apdo. 199, 1250 Escazu, Costa Rica, FAX 506-49-19-29 or 53- 42-27.

Fellowships and Funding

NRP/AIT Scholarships for Master's degree in the Natural Resources Program in Thailand beginning in May 1992. See Tropinet 2:2. Information: Ms. S. Phanichkul, Assistant Academic Secretary (Admissions), AIT, P.O. Box 2754, Bangkok 10501 Thailand.

NSF-Science in Developing Countries Program (SDC) makes small grants ($20,000 or less) to advance the international exchange of scientific knowledge and to contribute to the

scientific infrastructure of developing countries. Dissertation improvement grants are made to U.S. institutions that sponsor SDC projects for support of developing-country graduate students who are enrolled at U.S. universities and are qualified to undertake a dissertation research project. Field equipment and supplies, and travel to and from research sites are covered. No stipend, tuition, fees, or indirect costs are provided. Only projects related to a developing-country problem and approved by a U.S. research advisor are considered for support. Target dates: September 1st and March 1st. Submit proposals (10 copies) to: Central Processing Section, National Science Foundation, Washington, DC 20550.

The Scott Neotropic Fund of the Lincoln Park Zoo offers small grants for projects that generate information contributing to the conservation of Latin American wildlife. Projects that involve students (both North and Latin American) are favored. Salaries and permanent equipment cannot be supported. Deadline: 1 August 1992. Information: S. D. Thompson, Director of Conservation and Science, Lincoln Park Zoo, 2200 North Cannon Drive, Chicago, IL 60614.

Graduate Programs

Ecology for Peace. The Universidad para la Paz, Costa Rica, announces a master's program in natural resources and sustainable development. The two year program involves courses, special projects and a thesis. Applicants should have university degrees in natural resources or related fields (including social sciences), field experience where conflict resolution is critical (e.g., refugees, agrarian reform, pollution), fluency in Spanish and English (French or Portuguese also desirable). Information: F. Matos, Masters program Ecology for Peace, Univ. para la Paz, Apdo. 199-1250, Escazu, Costa Rica, Tel. 506-49-15-13, FAX 506-49-15-13.

Masters in ERA, Thailand and Germany. The Univ. of Saarland, Germany and Chiang Mai Univ., Thailand are offering a joint Master's program in Environmental Risk Assessment for Tropical Ecosystems. This program is aimed at scientists from both governmental and nongovernmental organizations working in developing countries and combines theoretical concepts, analytical tools, practical work, case studies, seminars and a thesis. The goal is to train students to identify, assess and analyze interacting biogeochemical processes related to environmental risk for tropical ecosystems, and to enable them to use this knowledge to help improve research projects and development plans. The program is based at Chiang Mai in northern Thailand. There are many suitable locations nearby for field studies. Research facilities include modern laboratory and field equipment, and personal computers. The program's core courses focus on practical techniques for environmental monitoring in the field and lab, as well as broader courses in ecology, conservation, and environmental law. The courses are taught in English, and the 2 semester academic year starts in June. The program is limited to 15 students per year and is fully subscribed for 1992; applicants to join the program in June 1993 must submit applications by March 1, 1993. Successful applicants are eligible to apply for scholarships. Information: The Chairman, Environmental Risk Assessment Program, Faculty of Science, Chiang Mai Univ., Chiang Mai 50002, Thailand, Tel. 053 221699 ext.3316, Fax 6653 222268.

Graduate Research Assistantships-Environmental Conservation and Sustainable Development. Cornell Univ. has been awarded a Research Training Grant (RTG) by NSF to support an interdisciplinary program entitled, Ecological and Social Science Challenges in Conservation. Applications are being accepted for graduate research assistantships for the academic year 1992-1993. The objective of the RTG is to train graduate students seeking solutions to the environmental degradation crisis confronting tropical ecosystems. Ongoing projects in Costa

Rica and the Dominican Republic provide the research framework for the program. Information: Dr. T. Fahey, RTG Director, Dept. of Natural Resources, Fernow Hall, Cornell Univ., Ithaca, NY 14853 USA.

Book Review

The State of Nature Conservation in Malaysia. Edited by Ruth Kiew and published by the Malayan Nature Society, 485 Jalan 5/53, 46000 Petaling Jaya, Selangor, Malaysia. This outstanding report, with 31 chapters written by leading experts, summarizes current research knowledge and conservation issues in many critical aspects of Malaysian natural history. The quality of presentation is excellent. The report serves as a valuable guide to government and non- government reports that are hard to find. Particularly valuable reports are those on caves, orchids, Rafflesia, palms, molluscs, butterflies and moths, sea-turtles, birds, primates, large mammals, and national parks.--R.B. Primack, Dept. of Biology, Boston Univ., Boston, MA 02215.

Publications

Accounts Overdue: Natural Resource Depreciation in Costa Rica. Prepared by the World Resources Institute and now available from WRI Publications, P.O. Box 4852, Hampden Station, Baltimore, MD 21210, Tel. 1-800-822-0504.

Conservation Biology: The Theory and Practice of Nature Conservation, Preservation, and Management. P.L. Fiedler and S.K. Jain, eds. For academics who teach biology and individuals with an interest in preserving biodiversity. To order: Chapman & Hall, 29 West Street, New York, NY 10001- 2291, Tel. 212-244-3336, FAX 212-563-2269.

Debt-for-Nature Exchanges and Biosphere Reserves, Experiences and Potential. MAB Digest No. 6, by P. Dogse and B. von Droste, UNESCO. This paper provides background on the origin and workings of Debt-for-Nature swaps, and assesses benefits, constraints, and future prospects. To order: UNESCO, B.PP. 3.07 Paris, 7 place de Fontenoy 75700 Paris, France.

Maruia Quarterly. The New Zealand-based Maruia Society, a conservation organization that works in New Zealand, Solomon Islands, Papua New Guinea and Fiji, has produced the first issue of a quarterly magazine, Maruia, which will feature solution-oriented articles on environmental issues. The first issue contains articles on the work of the Society field staff in the South Pacific. Information: The Secretary, Maruia Society, P.O. Box 756, Nelson, New Zealand. Tel. 3-54-83336, FAX 3-54-87525.

World Resources 1987-Spanish Edition. A report from the International Institute of the Environment and Development, with the World Resources Institute (WRI). Summarizes the world's most critical environmental problems. Free from Basic Books, New York, NY USA. (ref.: File: "CONSLINK TROPINET")

CHAPTER 6

ONLINE COMMENTS

This Section contains online comments on earlier contributions or the Workshop reports. Many comments are informal and apart from editing of occasional repetition or matters not related directly to the workshop discussions, have been left as contributed.

6.1 SOME ACRONYMS

Contributed by:

Dora Ann Lange Canhos dora@bdt.ftpt.ansp.br
Base de Dados TropicalBT North America 42:CDT0094
Fundacao Andre ToselloTel: 55 192 427022
Fax: 55 192 427827

I was asked by Michele Sato, from East Anglia, the meaning of the acronyms of those organizations that have sent their contributions to 'biodiv-l'. As this may be of interest to other participants, I am sending my answer to the list. As perhaps even the name may not be sufficient, I have included a brief introduction of what these organizations are or do. In order to avoid any misinterpretation from my side, I have tried to use the same "wording" as the authors, and apologize in advance for any mistake. We strongly recommend that each file be read by the participants of 'biodiv-l'.

MSDN (Microbial Strain Data Network), an international information and communications network for microbiologists and biotechnologists.

SCIENCEnet, a collaboratory, a communications and working environment for researchers in the earth and environmental sciences from over 50 countries.

BIOMASS. This contribution is a view of Mark Thorley, from the Antarctic Environmental Data Centre, concerning "Information Management for Biodiversity, an Antarctic Perspective. This paper includes the two SCAR (Scientific Committee on Antarctic Research) sponsored programmes: BIOTAS (Biological Investigations of Terrestrial Antarctic Systems Programme) and BIOMASS (Biological Investigations of Marine Antarctic Systems and Stocks Programme).

IBPGR (International Board for Plant Genetic Resources), a centre of the CGIAR (Consultative Group on International Agricultural Research) directly concerned with plant genetic resources.

UNIDO (United Nations Industrial Development Organization). This contribution submitted by Dr. George Tzotzos, UNIDO, includes biological information resources at Unido and ICGEB (International Centre for Genetic Engineering and Biotechnology).

MGD (Microbial Germplasm Database), began at Oregon State University by Moore and Hanus in 1989. It has to date identified more than 400,000 bacteria, fungi viruses, fastidious procaryotes, entomophagous microorganisms, nematodes, cloned genes, viroids, algae, protozoa and other reproducible elements utilized in more that 400 labs associated with plant sciences and agriculture throughout the U.S.

IOPI (International Organisation for Plant Information), established to integrate and extend the work of the Species Plantarum Project and the Global Plant Species Information System Groups, and to replace them.

CODATA (Committee on Data for Science and Technology) of the International Council of Scientific Unions (ICSU) has created a Commission on Standardized Terminology for Access to Biological Data. This contribution describes the goal and activities of this commission.

NHM (Natural History Museum) of London. This contribution describes the networking activity of the Museum.

APC (Association for Progressive Communications). Contribution sent by Andrew Garton, Pactok Project Coordinator.

6.2 COMMENTS ON THE FIRST WORKING GROUP SUMMARY

From Micah Krichevsky
mik@nihcu.bitnet
BT North America 42:CDT0002

The idea of a networking effort that includes the have nots or will nots with respect to electronic communication is conceptually laudable. For public relations and theoretical considerations it must be included in any design. I have espoused the same concept in many talks and writings so I must support it once again.

However, the reality of experience dictates another view. Because of the time factor of electronic communication versus any other form of non-volatile communication (printed mail mostly), the haves quickly become functionally impatient with the have nots. The persons not wired into the bulletin boards are not truly participants but temporally displaced voyeurs. Avoiding this situation is virtually impossible in my opinion.

I would rather see a concerted goal and effort to achieve that goal of providing the electronic wherewithal and motivating the participation. This is not as far fetched as it may seem at first glance. There is interest in various funding agencies in providing equipment and initial funding for connect time to individual scientists in developing nations. I suggest a campaign to develop such subsidy on an organized basis.

A Secretariat of some sort with paid staff will be needed if anything meaningful is to evolve from this and subsequent Workshops. I certainly do not think this is optional. Volunteer efforts should be welcome and encouraged but cannot substitute for paid staff.

If a databases on Biodiversity Information Resources and Services (see we already have an Acronym: BIRS, pronounced: beers) is to be constructed, then someone will have to do it. This is a large assignment and one which I suggest is eminently deferrable. The equivalent will evolve through the online directories and selection menus. For example, I was informed today that there is a lot of activity in the INTERNET community to solve the problems of finding out what is available throughout the system. I was told that major advances in this area will be available in 6-10 months. My source is an INTERNET junkie who is online 2 hours a day when not doing his RNA probe research!

I still think a systems analysis is one of two initial items to be done. I outlined my thoughts on this previously.

The other is the linking of the easily linked information resources to get started. The initial linking can be relatively haphazard so long as it is made very clear to the user that the initial efforts are opportunistic in nature. Both these efforts will require human and economic resources and an administrative umbrella and home. Else, where lies the accountability?

6.3 PERSONAL COMMENTS ON NETWORK DESIGN

From Jeffrey Shaw: j.shaw@[C[C[C.ftpt.ansp.br

I have to admit that I have had difficulty in keeping up with the quantity of material that the Workshop has generated and surely this is simply a reflection of the number of Networks that are presently running or just about to run.

This to me emphasizes the importance for collaboration and integration and the need to avoid duplication which can of course best be handled by a central coordinating body. Such a body will need funding and permanent staff.

Specialist Networks should be encouraged and when possible supported as these are the building bricks of a "Biodiversity Network". I suspect that it will grow much like a spiders web and that each specialist Network will find the best position for it in the interconnecting web that I am sure will grow naturally and quickly.

Personally I have found the workshop immensely useful as it has introduced me to a world that I was really not aware of.

6.4 INFO SOFTWARE

Contributed by:

Sidnei de Souzasidnei@bdt.ftpt.ansp.br
Base de Dados TropicalBT North America 42:CDT0360
Fundacao Andre ToselloTel: 55 192 427022
Fax: 55 192 427827

As your question on INFO may be of interest to others, I'll be posting the answers to your questions to biodiv-l.

I strongly agree with you that softwares like Info and Almanac should be considered a very good option to make information available in an easier and cheaper way.

In order to answer your questions, I think I should tell you a little bit more about Info.

The first version of Info was developed by BDT staff as a local solution for making some data we considered important, available to others. It was developed in Turbo Pascal to run on a PC-XT machine that could receive external calls via an X.28 dedicated line. We ran the database this way for two years.

When we got the Sun workstations, we decided to migrate the software to Unix. The Info was then rewritten in Sun Pascal and made available through an X.25 line.

So, Info is the actual database management system used by BDT and the dbserver is an interface, also written by BDT, to understand mail messages as database queries. So, the dbserver interprets the messages and passes them to Info.

As to your question about how to make your database available, we only need the data as a plain text file. If you want to try this, please, send a sample of the data you have and we can set up a database for you to try.

6.5 INFO SOFTWARE

From: Eng-leong Foo, Karolinska Institute, Stockholm, Sweden Unesco Microbial Resources Center & Dept of Bacteriology
Tel: 46 8 7287147 Fax: 46 8 331547
email: eng-leong_foo_mircen-ki%micforum@mica.mic.ki.se

Thank you, Sidnei de Souza, for posting information on the INFO software.

"The main idea was to make the on-line databases available to users of different systems that have e-mail. Users send a message to the database server with specific instructions as to the database and keywords to be searched. As an answer, the user receives an automatically generated message with the result of his/her query."

I have used a similar software "ALMANAC" (@oes.orst.edu, Oregon State University) and have found it very simple to use. Softwares like INFO and ALMANAC offers a solution to make more databases accessible and available at free of charge to e-mail users and to enable e-mail users to access such databases without the need of conventional IPSS access or advanced Internet/FTP access. This will also mean that an e-mail user (in a city) can help colleagues at a remote research station or in the bush by just using the minimal local telecommunication utilities (computer-to-computer or fax) or post.

I have a database in my office which the Biodiversity Information Network has found to be useful. My institute has a simple e-mail utility on a small machine which connected to INTERNET.

Q: how does one proceed to make my database available?
Q: what database program does INFO operate best with or does INFO have its own database program?

6.6 DIRECTORY PROTOTYPE

From:

Dora Ann Lange Canhos dora@bdt.ftpt.ansp.br
Base de Dados Tropical BT North America CDT0094
Fundacao Andre Tosello Tel: 55 192 427022
Fax: 55 192 427827

We are trying to set up a directory as a prototype for the Biodiversity Network workshop. We are setting up a database on databases with the following information:

Title:
Category:
Type of access:
Cost:
Location:
Contents:
How to access:
Contact Person:

As an example we present one of our databases:

Title:	NATIONAL CATALOGUE OF BACTERIA (BRAZIL)
CATEGORY:	database
TYPE OF ACCESS:	Public
COST:	Free
LOCATION:	BDTNet, FTPT, Campinas, Sao Paulo, Brazil
CONTENTS:	Holdings: genus, species and variety, authority, collection acronym and number, origin, equivalence in other collections, preservation method, and other information. Collections: address, general description of holdings, research activities, and services
HOW TO ACCESS:	e-mail: dbserver@bdt.ftpt.ansp.br use bacter help available PSDN: (724)11925019; login: guest private username provided upon request telnet: not available ftp: not available MSDN: BT North America PSS: Europe 023421920100475 UK A21920100475 Rest of World 2342192000475
Contact Person:	manager@bdt.ftpt.ansp.br MSDN: 142:CDT0360

If you can supply us with information, please do so, as soon as possible. Information may be sent directly to the list (biodiv-l@bdt.ftpt.ansp.br) or to me (dora@bdt.ftpt.ansp.br).

6.7 ST.LUCIA PROJECT ON BIRD ECOLOGY

Dear Friends,

A colleague from our lab. at the Biological Science Dept. - University of Dundee, is leaving to St.Lucia where he will be working during the next 2 years, in a research project on Bird Ecology.

Therefore, we would like to exchange informations with groups involved in this area as much as possible.

If you are one of these groups, please contact:

Ricardo L.L.Berbara Email: bs0710@uk.ac.dund.pb
University of Dundee
Department of Biological Sciences
Dundee, DD1 4HN Scotland

Every message will be welcomed. Thanks/Saudacoes/Saludos

Ricardo L.L.Berbara.

6.8 OSWALDO CRUZ FOUNDATION

Contributed by:

Drs. Carlos Medicis Morel (Morel@fiocruz.bitnet) Wim Maurits Degrave (Wim@fiocruz.bitnet)
Network : Latinbio@fiocruz.bitnet
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Fiocruz - Av. Brazil 4365 - Manguinhos
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21045-900
Tel: 55 21 2907549
Fax: 55 21 5903495

Through the Tropical Database Network listserver we learned about the Biodiversity Network initiative. Since 1988, the Oswaldo Cruz Foundation (Fiocruz) in Rio de Janeiro, keeps GCG and other software for Molecular Biology running on a VAX, and keeps on-line (with every three months updating) Genbank, EMBL, PIR, Swissprot, Vecbase, Rebase, Enzymebase databases.

Regular local, national and international courses have been organized in this period for Computer analysis of nucleic acid and protein sequences and the use of networks for biotechnology. We are now setting up a Latin-American Biotechnology Network, specialized in networking for Molecular Biology ("Latin-Bionet") for which Fiocruz will be a central node. We will spread a regular newsletter, starting later this month. Please keep us informed about your activities, news etc.

6.9 COMMENTS ON NETWORK COSTS

Contributed by:

Eng-leong Foo, Karolinska Institute, Stockholm, Sweden
Unesco Microbial Resources Center & Dept of Bacteriology
Tel: 46 8 7287147 Fax: 46 8 31547
email: eng-leong_foo_mircen-ki%micforum@mica.mic.ki.se

Here is a comment:

Very high priority should be given to making any biodiversity information system available to persons in LDCs, Eastern Europe and remote areas. This will require that fees be as low as possible ....

Source: Micah Krichevsky's position paper: Considerations in design of a biodiversity network system

This is certainly a very, very important issue to be discussed here (biodiv-l) and which Working Groups for "Model for a Biodiversity Network" and "Administration and Funding Needs" will also deal with.

As examples, here are excerpts from two recent messages that I have received:

Recently, all users (in Chile) of the Internet, including universities, were notified that starting July 1st, there will be a minimum monthly rate plus a charge per megabyte of international traffic, with 18% sales tax on top. i.e., 10 MB of traffic equals CDN$310.00, plus the minimum rate, plus tax... The minimum monthly wage in this country is 38,000 pesos, roughly CDN$134.00.....This may very well mean that university professors will have to obtain clearance from department heads before replying to colleagues abroad or accepting mail from them.

Patricio Mason <pmason@CHASQUI.MIC.CL>

May I request that my name be removed from the general mailing list of BNF net as the Malaysian govt now requires us to pay the bills for all incoming mail....I cannot afford to pay to read them at the current VERY high rates (we are charged by the bytes!).

Amitabha Guha <AGuha@ARAB.MY>

Quoting Micah Krichevsky again "The stated goal in many situations is to make the information publicly available. In practice, this goal is seldom achieved"; not because of technical reasons but socio-economic ones. Even good intentions to develop databases using softwares like INFO from BDT, which allows database searching by mailing a query to the database server and the answer is sent by e-mail, are more attractive to e-mail users than those offered by "not-for-profit" database information systems; we must address a basic question:

Is BIODnet to be designed for target groups like decision makers and managers OR for field workers and researchers ?

6.10 GLOBAL ENVIRONMENT FUND QUESTION

From:

Eng-leong Foo, Karolinska Institute, Stockholm, Sweden
Unesco Microbial Resources Center & Dept of Bacteriology
Phone: 46-8-7287147 Fax: 46-8-331547
email: eng-leong_foo_mircen-ki%micforum@mica.mic.ki.se
eng-leong_foo_ba@kicom.ki.se

From the Global Environment Facility (GEF) initial budget of USD 1.4 billion, 240 million is reserved for the preservation of biodiversity. Projects that are currently carried out with GEF money, are in Congo, Bhutan, Laos, the Philippines, Vietnam, Poland, Brazil, Colombia, Mexico and Guyana. Their aims, mostly "to protect biodiversity through human resources development and institutional strengthening, and through designation, establishment, and management of priority protected areas".

Source: Robin Pistorius, The Global Environment Facility: a key fund for biodiversity preservation?. Biotechnol & Develop Monitor. Nr.11. June 1992.

Q: Does anyone here have more details on these GEF projects, - contact names, title of projects, institutes undertaking these projects, etc?

6.11 GLOBAL ENVIRONMENT FUND (GEF)

Contributed by:

Anthony Whitworth: anthony@igc.org

Eng-Leong_Foo_BA%KICOM.KI.SE@UICVM.UIC.EDU wonders:

Q: Does anyone here have more details on these GEF projects, - contact names, title of projects, institutes undertaking these projects, etc.

We have 844k of "GEF 3RD TRANCHE DOCUMENTATION" provided by the GEF Secretariat, and kindly uploaded by John Waugh 'iucnus@igc.org'. I will be happy to make them available to anyone who asks.

Regards

Anthony Whitworth, BD Project Coordinator
EcoNet - Institute for Global Communications

Volume One: Report by the Chairman to the April, 1992 Participant's Meeting

Volume Two: Africa Region Investment Projects

Volume Two: Asia Region Investment and Technical Assistance Projects

Volume Two: Arab States and Europe Investment Projects

Volume Two: Latin America and the Caribbean Region Investment and Technical Assistance Projects

Global Change System for Analysis, Research & Training (START)

Volume Two -- Annex 1: USA Parallel Cofinancing.

Quote from iucnus@igc.org original posting:

The documentation is incomplete. Annexes 1 - 7 of Volume One were in graphic format that could not be converted to ASCII. In stripping the documents to ascii, a considerable amount of formatting was lost, together with some charts and tables. The documents don't bear physical resemblance to the published versions, but care has been taken not to alter the text. IUCN urges you to contact the appropriate individuals and organizations directly. For general information requests, contact the GEF Secretariat through:

Mr. Ian Johnson
Administrator, Global Environment Facility
World Bank
1818 H St NW
Washington DC 20433 USA

fax 1.202.473.1053

If you wish further information about an "Investment" project component of the GEF, you should contact the World Bank:

Mr. Ken Newcombe
Operations Coordinator, Global Environment Facility
The World Bank
Washington DC 20433 USA
fax 1.202.676.0483

"Technical Assistance" project components of the GEF are handled by the United Nations Development Program (UNDP). Requests for information on any proposal for technical assistance should be directed to:

GEF Technical Advisory Division
UNDP
One United Nations Plaza
New York NY 10017 USA
fax 1.212.906.5365

You may also wish to contact the United Nations Environment Program in regards to the Secretariat and Technical Advisory Panel on other matters:

Mikko Pyhala
Chief, GEF Unit
United Nations Environment Programme
P O Box 30552
Nairobi, Kenya
fax 254.2.520825

We would appreciate your cooperation in the following ways:

If you represent an IUCN member organization and wish to be put on our GEF mailing list, please write to our e-mail address, iucnus@igc.org or send copies of your correspondence to us at:

IUCN-US
1400 16th St NW
Washington DC 20036 USA

6.12 INTERNATIONAL COOPERATIVE BIODIVERSITY GROUPS: GRANT OPPORTUNITY

The National Institutes for Health, the National Institutes for Mental Health, the National Science Foundation and the U.S. Agency for International Development invite applications for the establishment of International Cooperative Biodiversity Groups (ICBG) The Fogarty International Center of the NIH will administer the program. Applicants are asked to submit by September, 1992 a short letter of intent. Full applications are due November 17,1992.

The purpose of the grants is to promote conservation of biological diversity through discovery of bioactive agents from natural products and insure equitable economic benefits therefrom. Each ICBG should focus on drug development, biodiversity, and economic growth. Active participation by multiple U.S. and developing country institutions is expected.

For further details contact: Dr. Kenneth Bridbord, Chief, International Studies Branch, Fogarty International Center, NIH, Building 31, Room B2C32, Bethesda, Maryland 20892. (301) 496- 2516. Fax: (301) 402-2056.

6.13 ENVIRONMENT CANADA COMMENTS

Contributed by:

Celie Handfield: BT North America 42:CDT0481

COMMENTS FOR THE BIODIVERSITY WORKSHOP

I am currently working for Environment Canada in the Biotechnology Section of the Commercial Chemicals Branch. We have to evaluate the risks of introducing microorganisms in the environment. The sources of information we need to access is sparse, sometimes not easily accessible or even non-existent. We need information on:

- the identification and characterization of microorganisms, bacteria, fungi, yeasts, algae, protozoa, virus, animal and plant cells, in pure and mixed cultures, including the taxonomy of microorganisms, their problems and updates;
- biological and ecological properties;
- environmental fate and effects including its uses in the environment;
- laboratory and field testing protocols;
- monitoring and termination procedures;
- contingency planning;

When information is non-existent it is important to have access to a network of experts that may answer some of our questions. Also, a network would be important to disseminate information in development and research done in the area of environmental protection and biotechnology to allow partnership so there is no duplication of work but also to allow more consistency.

Further to Dr. Krichevsky's comments, a biodiversity network may be able to make information available but I would see it also to compile information as a first phase, since we do not know exactly what is available now.

A number of comments pertaining to search capabilities: I would see this step in phase two. Once the information is collated or linked to form a knowledge base, the next step would be to use tools to translate, make searches or even direct the user to the available sources of information.

At the moment, using MSDN has allowed us to communicate more easily with experts in other regulatory agencies and in microbiology and taxonomy throughout the world, to share expertise and get advice.

We also have participated in a number of workshops and working groups in Canada for Culture collection, Biodiversity and Biosystematics.

We are also interested in the Database of Databases that you are trying to develop at the moment.

We are interested in following the development of this biodiversity system as it will allow us to access environmental information more easily.

Celine Handfield
Environment Canada

6.14 COMMENTS ON FIRST SUMMARY

Contributed by:

Joe Hanus| E-MAIL hanusj@bionette.cgrb.orst.edu
Microbial Germplasm Database|
Dept. of Botany and Plant Pathology| Tel: 1 503 7375300
Oregon State University| Fax: 1 503 7373045
Corvallis, OR 97331-2902|

Comments on Micah Krichevsky's posting of 7/29/92

Micah points out in his "Comments on the First Summary" that there is a rapid evolution of internet connectivity that can change the way we perceive the linking of separate data resources and may solve some of the problems that we as data providers have in reaching our audience. Much of this evolution is occurring in software that is in the public domain and is accessible to anyone with an internet connection. It, to some degree, makes it possible for anyone to become a data resource provider and allows any interested person to systematically browse that resource through the internet. (In fact, one can search Genbank, Weather Information (including the lastest satellite maps), The Bible, hugh directories of email addresses, Roget's Thesaurus, the New Hacker's Dictionary of Computer Jargon, and several hundred other resources on servers throughout the world.) This, in part, obviates the need for highly structured hard-wired connections between large data resources. As a result of my work with MGD, I have become (in Micah's words) an "Internet junkie" and I find these developments that have occurred over the last few months to be exhilarating. They have potential for changing much more than the manner in which we manage biological data.

Three of the public domain internet browsers are WAIS (Wide Area Information Server, initially developed jointly by Thinking machines, Apple Computer, and Dow-Jones), Gopher, (developed initially as a campus information server at University of Minnesota) and World Wide Web (a hypertext-hypermedia browser whose home base is CERN, the European Particle Physics Laboratory at Geneva Switzerland). Each has its strong points.

WAIS provides a highly sophisticated indexing system so that a record may be located by a statement such as "tell me about the song bird population of the Mississippi Delta region of Southern Louisiana". A search will turn up many possible records satisfying the query. The searcher can then select one of the records that closely matches what s/he had in mind and respond "find me more records similar to this one". This process, termed relevance feedback, makes it possible to pursue queries in an intuitive manner that would be extremely clumsy for boolean searches in a traditional database.

Gopher (Originally so named because the school mascot of the developing institution is the Golden Gopher. The name has persisted because, once contact is initiated with a gopher server, one can easily 'pop up' at another gopher server in a fashion similar to moving from one location to another through gopher burrows) is based on ftp (file transfer protocol) and can support keyword searches as well as facile browsing of records in a logically organized directory structure. Gopher recognizes file and directory links (UNIX) so that the same information can be view in the context of a variety of directory trees.

World Wide Web supports hypertext links within documents and directories. Links allow you to select words or data objects and jump to them, then return to your original location. For example a database record might contain an unfamiliar term. Selecting the term would

provide you with a definition. Selecting an icon in the definition could provide a picture with annotation. Selecting a word in the annotation could provide you with a further description of images in the picture. It allows the reading of information in a multidimensional rather than top-to-bottom, left-to-right (or right-to-left) manner. Using an extension of SGML (standardized general markup language) multimedia objects can be embedded in the text and searches can be network wide.

The power of these information distribution strategies is that they are relatively platform independent. They are all built on a client-server paradigm with most of the sophistication built into the server using well-defined protocols for both search and information transfer. The client, the computer that can makes request of the server across the Internet, then displays the responses at the user's end, can be practically anything. Client software is available (public domain) for Macintosh, MS-DOS PC's, NeXT, and almost any UNIX machine. The only requirement is an Internet connection.

This democratization of access to Internet resources makes it possible to share information without imposing rigidity on the structure of the data or predefining the group with whom the information can be shared. This impacts on the access of information to those who are 'have nots' and 'will nots'. For the 'have nots', no sophisticated hardware or expensive software is required. For the 'will nots' (many of whom are not comfortable in what has been perceived to be a habitat for the technically elite) the use of the internet is virtually transparent and the search strategies are intuitive.

I think Micah's projection that within 6-10 months, we'll see major advances in access to internet resources is entirely correct. It offers exciting possibilities.

If you're interested in obtaining any of the public domain software, email me and I will send you addresses for the sites where the programs are archived.

6.15 GLOBAL NETWORKS INFORMATION

responses to queries by Joe Hanus

Contributed by:

Joe Hanus| E-MAIL hanusj@bionette.cgrb.orst.edu
Microbial Germplasm Database|
Dept. of Botany and Plant Pathology| Tel: 1 503 737 5300
Oregon State University| Fax: 1 503 737 3045
Corvallis, OR 97331-2902|

In previous mailings, Micah and I have commented on possible use of Internet information retrieval tools such as WAIS, Gopher and World Wide Web. Though these have application on local networks or even single machines and are not restricted to internet use, Micah pointed out the limitation of access to Internet in developing countries, a topic about which I, unfortunately know little.

I subscribe to another, mailing group (similar to biodiv-l) that addresses issues of Internet policy and access, and debates, often hotly, how the pie should be divided between the public and private sector. The group is populated by policy makers, NSFnet and Internet technical advisers, officers and technical personnel of companies selling access to the Internet, as well as interested non-combatants such as I. I asked them to give me some insight into how others not directly linked to internet, in poorly networked environments might be able to access the services which we are providing.

In short:

> There are many private providers selling access to the internet, many of which can be reached from 800 numbers or from anyplace there is a telephone.
>
> Email, bbs services are evolving (as shown by this workshop), many of which are under the wing of NGOs that provide a link to Internet and other networks at a relatively reasonable price.
>
> Users not directly linked to high speed networks should be able to avail themselves of most functions of a database particularly if they have a modem link and an account on linked nodes.
>
> Even users with only modem access can still use terminal emulations to perform most database queries, providing they simply want an answer with under 100,000k of data. Large binary files, such as images would be awkward (expensive) to transfer.

We think it is desirable to build an information resource that is full featured and can approach the potential that high speed networking allows. Yet, no user should be excluded from formulation of rudimentary queries because of hardware or connectivity limitations. We think the best approach is to provide tiered access, allowing participation by users at any level from email to unix workstations.

I am enclosing the responses that I received from my query to the Internet mailing group. I have abridged some that enclosed lengthy lists or brochures. I can forward those to any that request them.

Date: Thu, 30 Jul 92 15:29:54 EDT
From: Ellen.Hoffman@um.cc.umich.edu
To: hanusj@cgrb.orst.edu
Subject: Internetting in emerging nations: Request for Ideas

Thought I'd reply privately. From my experience, the question really depends on what you mean by access. Are the participants signing on to a central "host" machine and doing their work on it, so that they can use dumb terminals? Are they using a client-server model that requires high speed access? There are many dial-in solutions today that don't require high speed access (for example, in some areas of Michigan Merit still supports 300bps although this is less and less common as 9600 and higher are also being made available.) Many network providers have some such offering which don't require high speeds but they also are not adequate for all applications.

Over 80 countries have direct Internet access today, but in some cases that is a national network connecting many research and educational institutions, and in other cases is only a link to a single university. The greatest handicap in many areas of the world is lack of telecommunication infrastructure. In some areas, people can't even get a telephone let alone any more high featured services.

If you want an example of services we offer (and I don't mean this as a sales pitch), Merit has connections to SprintNet which makes it possible to dial in from anywhere in the world that Sprint service reaches. A user calls a local SprintNet number (most these start at 1200bps), connects through to MichNet and from there can reach anywhere in the Internet. But since SprintNet isn't IP, it won't work for all applications. Most such uses do something like VT100 emulation and then sign onto another computer where the actual work is done. It can be used for moving files but not FTP, and doesn't support client-server models. I suspect with the announcement from Sprint of SprintLink that it may also be possible to find some sort of service directly from them.

Hope that helps. Let me know if I can be of further assistance.

Ellen Hoffman
Merit Network, Inc.

To: hanusj@cgrb.orst.edu
From: Jeremy Allaire
Mime-Version: 1.0
Content-Type: TEXT/PLAIN; CHARSET=US-ASCII
Content-Transfer-Encoding: 7BIT

I just read your posting to the com-priv list. I have a number of suggestions.

First, there is a service called EcoNet which is available Internationally through TymeNet, which can be accessed in nearly every major country. EcoNet provides access to thousands of documents, both scientific and political information, conferences among private groups, or over already existing conferences. EcoNet officially networked UNCED via international links, and has a number of databases on-line which deal with this directly. EcoNet provides international access to mail, file transfer, and conferencing ability. It is magnitudes less expensive that a dedicated connection to the Internet, which you are unlikely going to find as an alternative anyway, since must emerging countries don't have a site that has direct access. I'm sending you an EcoNet brochure, and I also have a list of cities and countries where TymeNet is available if you would like it.

Second, a more grassroots approach would be to use UUCP or FidoNet. Both of these require only a PC and a modem. Thousands of cities in the world have UUCp and FidoNet gateways, and all that is needed to hook into them is an informal agreement between a host and your computer. However, these options don't provide the ability to high-speed computing, telnet, file transfer protocal, or access to databases. Although, since some databases that are available on the Internet take mail for query's, such alternatives are still possible. This is the low-tech, low-interconnection, and low-cost! solution.

By the way, I am a student with an emphasis in political science, international affairs, and international computer networks. I consult groups, schools, and local government on connecting to the Internet, and am currently involved in creating something called NativeNet (which is networking native american schools and tribal councils in MN and WI via UUCP and the Internet).

Look forward to hearing from you.

Sincerely,

Jeremy Allaire
Macalester College
jallaire@macalstr.edu
(H) 612 646 3572
(O) 612 297 2322

Subject: EcoNet Brochure
To: hanusj@cgrb.orst.edu
From: ECOnet staff

CONNECTING THE EARTH'S ENVIRONMENT THROUGH TELECOMMUNICATIONS

The following file is roughly 250 lines long. If you already know you want to sign up, go to line 148. If you are interested in Internet access, go to line 203.

If you're enquiring for the first time about EcoNet, here's the outline of this electronic 'brochure':

WHAT IS ECONET?
DIAL LOCALLY, ACT GLOBALLY
HARNESS POWERFUL TECHNOLOGY
ACCESS VITAL INFORMATION RESOURCES
SAVE TIME AND MONEY
REALIZE INTERNATIONAL CONNECTIVITY
NO SPECIAL COMPUTER REQUIRED
SERVICES:
    ELECTRONIC MAIL
    PUBLIC ELECTRONIC CONFERENCES
    PRIVATE ELECTRONIC CONFERENCES
WHY ECONET? Some project descriptions and testimonials
HOW MUCH DOES A SUBSCRIPTION COST? How to sign up.
DETAILS FOR OUR FRIENDS ON THE INTERNET

If, after reading this you still have questions, please do not hesitate to email them back to us. Please address them to:
econet@igc.org We appreciate your interest!

Regards,
The EcoNet Staff.

++++++++++++++++++++++++BROCHURE START

[I HAVE REMOVED THE BODY OF THE BROCHURE FOR THE SAKE OF BREVITY. I CAN FORWARD IT TO ANY BIODIVERSITY WORKSHOP PARTICIPANTS WHO REQUIRE IT. Joe hanus]

To: Joe Hanus/Microbial Germplasm Database <hanusj@cgrb.orst.edu
Subject: Internetting in emerging nations: Request for Ideas
From: Raj

In-Reply-To: Joe Hanus/Microbial Germplasm Database's message <9207301743.AA2731 8@cgrb.orst.edu> of 10:43:52 Thu 30 July 1992
References: <9207301743.AA27318@cgrb.orst.edu>

Although I am not an expert and there are many people better informed than I am, I think the answer to your problem is pretty simple. To use the Internet under field conditions, or in developing countries, unless you have a lot of money to install your own infrastructure, you have to use the existing infrastructure. The only relatively high bandwidth communications method that is typically available (i.e., faster than paper mail) is the telephone. So you have to use that. If you don't have a telephone, you have to bring one (cellular in developed areas, satellite, if you can afford it, otherwise). You can also do Internet over packet radio (a type of ham radio), but I think the bandwidth may be too low to be of use for anything but email. Anyway, if you have a telephone and a modem, you can call up anyone (probably your home base) that will let you use compressed SLIP (a way of using the Internet over a serial line), and you're all set. But if you have nothing better than 1200 baud say, you are not going to be FTPing images, etc. You could browse through databases, as long as the actual browsing is taking place on the well-connected machine, and then transfer what you want down to your field machine in the background. In practice you might find it simpler to log in to your home machine with the modem and skip the SLIP.

From: SEAN@SDG.DRA.COM (Sean Donelan)
Subject: Re: Internetting in emerging nations: Request for Ideas
To: com-priv@psi.com

[to use internet wide services]
You have to have access to a machine with full Internet connectivity. But the machine with Internet connectivity doesn't need to be co-located with the user. Even within the U.S. a large number of people use terminals connected to computer facilities in the next room, next building, or the next city to access Gopher, WAIS, etc. You don't need to run the IP packets all the way to the user's desk for them to have access to the Internet applications.

Sean Donelan, Data Research Associates, Inc, St. Louis, MO
Domain: sean@sdg.dra.com, Voice: (Work) +1 314-432-1100

To: Joe Hanus/Microbial Germplasm Database <hanusj@cgrb.orst.edu>
Subject: Re: Internetting in emerging nations: Request for Ideas
Date: Thu, 30 Jul 92 14:26:50 EDT
From: Steve Goldstein--Ph +1-202-357-9717
<sgoldste@cise.cise.nsf.gov>

I include a list of U.S.-based Internet service providers and related information-givers, courtesy of Vint Cerf.

For initial pointers to entry level networking in less-networked countries, drop a note to Randy Bush or John Klensin: randy@psg.com (Randy Bush)
John C Klensin <KLENSIN@INFOODS.MIT.EDU>

Subject: Internet Service Providers
Date: Fri, 22 May 92 04:53:41 -0400
>From: vcerf@nri.reston.va.us

INET-CONNECT 5/22/92
For assistance in determining where and how to connect to the Internet, send email to:
[I HAVE DELETED A LONG LIST OF INTERNET SERVICE PROVIDERS, WORLDWIDE, BOTH PUBLIC AND PRIVATE. PLEASE LET ME KNOW IF YOU WOULD LIKE A COPY. Joe hanus]

To: Joe Hanus/Microbial Germplasm Database <hanusj@cgrb.orst.edu>
Cc: com-priv@psi.com
Subject: Re: Internetting in emerging nations: Request for Ideas
Date: Thu, 30 Jul 92 14:17:09 -0400
From: Scott Brim <swb@nr-tech.cit.cornell.edu>

You might consider not trying to build this on top of an internet at all. It depends on how your databases are meant to be used, and where they are located. For exchange of ideas you might just get everyone on Usenet, which I assume you know about, or perhaps check the various dialup services. The providers on this list can tell you all about what they offer. I just want to mention one that isn't represented here: the servers run by the Institute for Global Communications (Econet and others for the United States, Alternex for Brazil, ...). These aren't really networks, despite some of their names. Rather they are servers (worldwide) which support electronic mail and conferencing and automatically pass information back and forth at least once a day -- sort of a turnkey Usenet with a small number of nodes, plus conferencing. In the USA they have Sprintnet dialup access and an 800 number for direct dial -- similar arrangements in other countries, I hear. I know a number of people, including some in Khabarovsk and Calcutta, who are extremely satisfied with this arrangement for worldwide collaboration. If you want to investigate, send mail to support@cdp.igc.org.

On the other hand, if there are databases you want to make available for general use by a large number of widely dispersed clients, in real time, 24 hours a day, you're better off with

Internet connections. On that subject as well, I'll step out of the way and let the providers speak for themselves.

Scott

From: Glenn.Kowack@mcsun.EU.net
To: Joe Hanus/Microbial Germplasm Database <hanusj@cgrb.orst.edu>
Subject: Re: Internetting in emerging nations: Request for Ideas
Date: Fri, 31 Jul 1992 11:15:22 +0200
Sender: glenn@mcsun.EU.net

Joe,
EUnet has been very active in creating networks in Central and Eastern Europe, the former Soviet Union region, and Northern Africa. The following is a quick description of who we are, our structure, and services. Please let me know if you require further information.
Regards, Glenn

Glenn.Kowack@eu.net Tel: +31 20 592-5109
EUnet, Kruislaan 409 Fax: +31 20 592-5155
1098 SJ Amsterdam, The Netherlands

----EUnet information follows----

EUnet

EUnet is the largest subscription-funded research-oriented network in Europe, serving users from Iceland to Russia, and as far South as Tunisia. Operating since 1982, EUnet connects over 2500 sites and networks, with gateways to major research networks around the world including NSFnet and the Internet. One of the longest operating R & D networks in Europe, EUnet serves a large number of countries across a wide geographic area.

EUnet and EurOpen EUnet is constituted as a service by and for the members of EurOpen, the European Forum for Open Systems. Founded in 1977, EurOpen is a non-profit association of Open Systems users, organized into National User Groups in Europe and beyond. At present EurOpen has over 6000 members. The close association of EUnet with EurOpen provides a continuing source of user input which ensures awareness of and sensitivity to user needs.

EUnet Organizational Structure
EUnet is a pan-European cooperative network made up of national networks located across Europe. Each EUnet National Network (or NalNet) operates in conjunction with their respective national EurOpen User Group. European level policy questions are addressed in three yearly meetings by representatives from each of the NalNets. Executive decisions are addressed by an Executive Committee, elected annually, in support of the EUnet Chief Executive.

The EUnet Executive Committee today includes:

Michael Nowlan	Chair (Ireland)
Axel Pawlik	Vice-Chair (Germany)
Joy Marino	Treasurer (Italy)
Ted Lindgreen	Secretary (The Netherlands)
Simon Poole	Member-at-large (Switzerland)

Frances Brazier	EurOpen Liaison (The Netherlands)
Glenn Kowack	Chief Executive (The Netherlands)

EUnet National Nets

Each NalNet operates its own National Network Operations Center (National NOC), which provides user support in the local languages. Technical problems and requests for services at the national level should be addressed to postmaster@<country>.eu.net. Many NalNets provide unique services. Please contact your NalNet for additional information.

EUnet European Network Operations Center - Amsterdam

Each EUnet NalNet connects to the European Network Operations Center (or NOC) in Amsterdam. From Amsterdam, EUnet connects to every major R & D network in Europe, and, via a 128kb leased line, to UUnet and the NSFnet in the United States. Technical problems at the European level should be addressed to postmaster@eu.net. Users interested in information on how to obtain an EUnet subscription should contact glenn@eu.net or their National EUnet Network.

EUnet Topology

Due to the distance-independent structure of digital line tariffs in Europe, a line between neighbouring countries usually costs the same as from any country to the Amsterdam NOC. Accordingly, EUnet is organized as a two-tier star network. Each NalNet (through their national NOC and various points of presence (POPs) is organized as a star and acts as a point of concentration for all traffic, which is then transmitted from each NalNet to the European NOC in Amsterdam for distribution to the other NalNets, peer networks, and intercontinentally. In some cases, NalNets connect to intervening NalNets, and from there to the Amsterdam NOC.

EUnet Services

EUnet services include:

Electronic Mail (E-mail),
Network News,
InterEUnet & UUCP,
the EUnet Archive, and
User Support Services.

Electronic Mail (E-mail)

EUnet supports Internet-style (RFC 822) mail over two transport services: IP (Internetworking Protocol) and UUCP (Unix-Unix CoPy). The total number of sites subscribing to EUnet e-mail is approximately 2500.

EUnet subscribers are usually charged by their NalNets for a basic subscription as well as by traffic level.

Network News

Network News is probably the world's largest "bulletin board" system: a system which permits the exchange of papers, notes, and replies (called "articles"), distributed across a

wide area. The vast majority of News articles are written by individuals participating in the group conversation of Network News. Articles are collected into topic areas known as newsgroups, of which there are approximately two thousand today. News groups may be moderated by an appointed specialist who filters articles before posting, or unmoderated, where articles are regulated only by the opinions of the readership.

Network News is supported by a variety of public-domain utilities, and is available over either UUCP or IP.

EUnet is the quality news provider, distributing news in a manner which is timely, efficient, and well-managed.

EUnet also acts as a distributor for persons interested in subscribing to CLARInet news groups. CLARInet, a commercial service, distributes wire service articles, some magazine articles, and articles written by CLARInet.

As with InterEUnet service and e-mail, each subscriber pays a basic subscription price. At the backbones this may be augmented either by charges for traffic or on the number of news groups offered.

InterEUnet and UUCP

EUnet provides telecommunications line management and "transport layer" services (UUCP and IP both intra- and inter-continentally).

UUCP is optimized for use over dial-up lines and is ideal for users for whom a low entry cost and control of expenditures is critical. UUCP is very cheap to install using PCs or workstations and public-domain software (available from EUnet). Dial-up line costs can be controlled on a daily basis: an administrator in financial trouble can simply stop dialling his NalNet.

InterEUnet is the EUnet IP service, provided since 1990, which includes a transmission and network layer service (TCP/IP) plus Remote Login (TELNET) and File Transfer (FTP - File Transfer Protocol).

Remote Login permits a user at a local computer to engage in an interactive session on a distant machine. Remote login is a very powerful vehicle for connecting users to geographically-dispersed resources. File Transfer makes it possible to send large files and types of files which are not possible by e-mail.

EUnet subscribers are typically charged by their NalNet for a basic UUCP or IP subscription plus access charges based upon traffic levels.

EUnet Archive

The EUnet Archive provides access to a variety of public-domain and some "shareware" software from the Amsterdam NOC and several of the NalNets as well.

The user may connect to the archive by using "anonymous FTP", the TCP/IP-based File Transfer Protocol. Anonymous FTP offers a restricted shell to explore the archive and retrieve files.

User Support at the National Level

EUnet operational support at the European and national levels is an important service to the user. Subscribers with problems interacting with other EUnet subscribers anywhere in Europe know that there is a single organization available to solve their problem.

EUnet Peer and Resource-Sharing Networks

EUnet connects to every major research network in Europe, and most research networks around the world. Peer international networks include:

EARN (European Academic Research Network),
HEPnet (High-Energy Physics Network),
NORDUnet (NORDIC Universities Network), and
NSFnet (US National Science Foundation Network).

EUnet is also a member of

Ebone '92 (European Backbone), and
The Commercial Internet Exchange (CIX) Association.

Several EUnet NalNets are users of IXI, the X.25 service.

[I HAVE DELETED ADDTIONAL MATERIAL, INCLUDING LISTING OF COUNTRIES. I CAN FORWARD THIS TO ANYONE INTERESTED] Joe hanus]

To: Joe Hanus/Microbial Germplasm Database <hanusj@cgrb.orst.edu>
Subject: Re: Internetting in emerging nations: Request for Ideas

Date: Thu, 30 Jul 92 14:26:50 EDT
From: Steve Goldstein--Ph +1-202-357-9717
<sgoldste@cise.cise.nsf.gov>

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randy@psg.com (Randy Bush)
John C Klensin <KLENSIN@INFOODS.MIT.EDU>

--SG

Subject: Internet Service Providers
Date: Fri, 22 May 92 04:53:41 -0400
>From: vcerf@nri.reston.va.us

INET-CONNECT 5/22/92

For assistance in determining where and how to connect to the Internet, send email to:

1. MERIT (University of Michigan)
   nsfnet-info@merit.edu
   or call: +1 800-66-MERIT (+1 800-666-3748)

2. FARNET

   Ms. Laura Breeden
   Executive Director
   FARNET, Inc.

   Work Address: 100 5th Avenue
   4th Floor
   Waltham, MA 02154
   USA
   Work Phone: +1 617-890-5117
   Work Fax: +1 617-890-5117
   Work Phone: +1 800-723-2763
   Email: breeden@farnet.org

3. NSFNet Network Service Center (NNSC)

   Ms. Corinne Carroll, User Services
   Work Address: NSF Network Service Center (NNSC)
   Bolt Beranek and Newman, Inc.
   10 Moulton Street
   Cambridge, MA 02174
   USA
   Work Phone: +1 617 873-3087
   Work Fax: +1 617 873-5620
   Email: ccarroll@nnsc.nsf.net

   Ms. April Marine
   Research Associate
   Work Address: SRI International
   NISC, Room EJ294
   333 Ravenswood Avenue
   Menlo Park, CA 94025
   Work Phone: +1 415-859-5318
   Work Fax: +1 415-859-6028
   Email: april@nisc.sri.com

Internet Service Providers

ANS

Joel Maloff
Vice President - Client Services
Advanced Network and Services
2901 Hubbard Rd.
Ann Arbor, MI 48105
Work Phone: +1 313 663 7610
Email: maloff@nis.ans.net

BARRNET

William Yundt
Pine Hall Rm. 115
Stanford, CA 94305-4122
Work Phone: +1 415 723 3104
Email:
gd.why@forsythe.stanford.edu
Work Fax: +1 415 723 0010

CERFnet

Susan Estrada
San Diego Supercomputer Center
P.O. Box 85608
San Diego, CA 92186-9784
Work Phone: +1 619 534 5067
Email: estradas@sdsc.edu
Work Fax: +1 619 534 5167

CICnet

Michael Staman
President
ITI Building
2901 Hubbard Drive Pod G
Ann Arbor, MI 48105
Email: staman@cic.net
Work Phone: +1 313 998 6101
Work Fax: +1 313 998 6105

Colorado Supernet

Ken Harmon
CSM Computing Center
Colorado School Mines
1500 Illinois
Golden, Colorado 80401
Work Phone: +1 303 273 3471
Email: kharmon@csn.org
Work Fax: +1 303 273 3475

CONCERT

Joe Ragland
CONCERT (Communications for NC Education, Research, and Technology)
P.O. Box 12889
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Research Triangle Park, NC 27709
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Email: jrr@concert.net
Work Fax: +1 919 248 1405

Cornell University

Martyne Hallgren
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Engineering and Theory Center Bldg
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Work Phone: +1 607 254 8767
Email:
martyne@mitchell.cit.cornell.edu
Work Fax: +1 607 255 0823

CREN

Jim Conklin
EDUCOM
1112 16th Street NW
Washington D.C. 20036
Work Phone: +1 202 872 4200
Email: conklin@bitnic.bitnet
Work Fax: +1 202 872 4318

CSUNET

Chris Taylor
Manager, Network Technology
Office of the Chancellor
Information Resources and Technology
P.O. Box 3842
Seal Beach, CA 90740-7842
Work Phone: +1 213 985 9669
Email: chris@calstate.edu
Work Fax: +1 213 985 9400

DataNet

Seppo Noppari
Telecom Finland
P.O. Box 228
Rautatienkata 10
33101 TAMPERE
Finland
Work Phone: +358 31 243 2242
Work Fax: +358 31 243 2211
Email: Seppo.Noppari@tele.fi

JVNCnet

Sergio Heker
6 von Neumann Hall
Princeton University
Princeton, NJ 08544
Work Phome: +1 609 258 2411
Email: heker@jvnc.net
Work Fax: +1 609 258 2424

Merit

Eric Aupperle
Merit Network
2200 Bonisteel Blvd.
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Work Phone: +1 313 764 9423
Email: ema@merit.edu
Work Fax: +1 313 747 3745

MIDnet

Dale Finkelson
29 WSEC
University of Nebraska
Lincoln, NE 68588
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Email: dmf@westie.unl.edu
Work Fax: +1 402 472 5280

MRNET

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Executive Director
The Minnesota Regional Network
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Minneapolis, Minnesota 55415
Work Phone: +1 612 342 2570
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Work Fax: +1 612 344 1716

NCAR

Joseph H. Choy
P.O. Box 3000
Boulder, CO 80307-3000
Work Phone: +1 303 497 1222
Email: choy@ncar.ucar.edu
Work Fax: (303) 497-1137

NEARnet

John Rugo
Accounts Manager
BBN Systems and Technologies
10 Moulton Street
Cambridge, MA 02138
Work Phone: +1 617 873 2935
Email: jrugo@nic.near.net

NETILLINOIS

Ed Krol
University of Illinois
Computing Services Office
1304 W. Springfield
Urbana, IL 61801
Work Phone: +1 217 333 7886
Email: e-krol@uiuc.edu

NevadaNet

Jim Williams
University of Nevada System
Computing Services
4505 Maryland Pkwy
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Work Phone: +1 702 739 3557
Email: greyfox@nevada.edu
Work Fax: +1 702 739 3791

NorthWestNet

Eric S. Hood
Executive Director
NorthWestNet
2435 233rd Place NE
Redmond, WA 98053
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Email: ehood@nwnet.net

NYSERnet

Jim Luckett
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111 College Place
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Syracuse, New York 13244
Work Phone: +1 315 443 4120
Email: luckett@nysernet.org
Work Fax: +1 315 425 7518

OARnet

Alison A. Brown
Ohio Supercomputer Center
1224 Kinnear Road
Columbus, Ohio 43085
Work Phone: +1 614 292 9248
Email: alison@osc.edu
Work Fax: +1 614 292 7168

Onet

Eugene Siciunas
4 Bancroft Ave., Rm. 116
University of Toronto
Toronto
Ontario M5S 1A1
Canada
Work Phone: +1 416 978 5058
Email: eugene@vm.utcs.utoronto.ca
Work Fax: +1 416 978 6620

PREPnet

Thomas W. Bajzek
530 North Neville Street
Pittsburgh, PA 15213
Work Phone: +1 412 268 7870
Email: twb+@andrew.cmu.edu
Work Fax: +1 412 268 7875

PSCnet

Eugene F. Hastings, II
Pittsburgh Supercomputing Center
4400 5th Avenue
Pittsburgh, PA 15213
Work Phone: +1 412 268 4960
Email: hastings@psc.edu
Work Fax: +1 412 268 5832

PSINet

William L. Schrader
President & CEO
11800 Sunrise Valley Drive
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Reston, VA 22091
Work Phone: +1 703 620 6651
Email: wls@psi.com
Work Fax: +1 703 620 4586

SDSCnet

E. Paul Love, Jr.
San Diego Supercomputer Center
P.O. Box 85608
San Diego, CA 92186-9784
Work Phone: +1 619 534 5043
Email: loveep@sdsc.edu
Work Fax: +1 619 514 5152

Sesquinet

Farrell Gerbode
Office of Networking and
Computing Systems
Rice University
Houston, TX 77251-1892
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Email: farrell@rice.edu
Work Fax: +1 713 527 6099

Sprint International

Bob Doyle
SprintLink Product Manager
Sprint International
13221 Woodland Park Drive
Herndon, VA 22071
Work Phone: +1 703 904 2167
Work Fax: +1 703 904 2680
Email: rdoyle@icm1.icp.net

SURAnet

Jack Hahn
1353 Computer Science Center
University of Maryland
College Park, Maryland 20742-2411
Work Phone: +1 301 454 5434
Email: hahn@umd5.umd.edu

SwipNet

Olle Wallner
SwipNet AB
P.O.Box 6048
S-164 06 KISTA
Sweden
Work Phone: +46 8 924040
Work Phone (direct): +46 8 924058
Work Fax: +46 8-963695
Email: wallner@swip.net

THEnet

Tracy LaQuey Parker
Computation Center
University of Texas
Austin, TX 78712
Work Phone: +1 512 471 5046
Email: tracy@utexas.edu

UUNET

Communications Services
3110 Fairview Park Drive
Suite 570
P.O. Box 2324
Falls Church, Va 22042
Work Phone: +1 703 876 5050
Work Fax: +1 703 876 5059
Email: uunet-request@uunet.uu.net
Email (uucp): uunet!uunet-request

VERnet

James A. Jokl
VERnet
Academic Computing Center
Gilmer Hall
University of Virginia
Charlottesville, VA 22903
Email: jaj@virginia.edu
Work Phone: +1 804 924 0616
Work Fax: +1 804 982 4715

Westnet

Pat Burns
UCC
601 S. Howes, 6th Floor South
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Fort Collins, CO 80523
Work Phone: +1 303 491 7260
Email:
pburns@yuma.ACNS.ColoState.EDU
Work Fax: +1 303 491 2293

6.16 INFORMATION MANAGEMENT - INFORMATION BROKERS COMMENTS

Contributed by:
Preston Hardison <pdh@u.washington.edu>

To: biodiv-l@bdt.ftpt.ansp.br
Subject: BIN Workshop Comments

I would like to see some discussion by workshop participants on how public and private software and databases might be integrated in a biodiverstity network, and on issues of intellectual property rights over data in such records. I endorse the free flow of information, and the non-profit, public domain model that seems to be the most discussed in the postings so far. I won't comment on the Intergraph/INBIO software project until I get some idea of price and availability of the software, and the mode of distribution of the INBIO databases. I am uncomfortable with the idea of information brokers, even benevolent ones, because of the manager-client relationships they create. Managing biodiversity under sustainable development will require more local access to information and participation in decision-making processes.

For example, ONIC, the indigenous representative organization of Colombia, representing over 700,000 indigenous people in 32 national organizations,has no computers, though they want the technology. And these are the people who live in the areas where much of the world's biodiversity still exists. Typically, these people do not work for environmental NGOs, governmental or inter-governmental institutions, or academic institutions documenting biodiversity and applying the information. The products, databases and services built into any biodiversity network must find ways of institutionalizing the participation of rural and tribal peoples.
The Nature Conservancy Conservation Data Centers provide another example. They are housed in a single office in a single building in one place in 12 Latin American countries. Many organizations spend much time and effort contributing to the databases, but the only organization that has effective access is the one that houses the proprietary software. I am not trying to slander the TNC - they do much good work. I think this model is wrong, however, because it represents the top-down approach to information management. The power of distributed networks will be realized when users are also made full participants and contributors.

I include a description of a software product I have been working on, and some thoughts about its distribution. The project proposal covers the range of databases that I would like to see included in a BIN.

6.17 BUSINESS INFORMATION NEEDS - COMMENTS

Contributed by:

Gordon Rands
Carlson School of Management, University of Minnesota,
grands@csom.spcs.umn.edu

after August 14, 1992
Smeal College of Business, Pennsylvania State University,
gpr3@PSUVM.BITNET

As a recent subscriber to the Biodiversity Network who is a social rather than a natural scientist, I would like to express my agreement of the need to include industry, and those academics who study the activities of business and other organizations, as among the users/targets of a biodiversity network. Attention to the environmental activities of business organizations is growing among business scholars. While biodiversity issues have not thus far drawn much attention, this will certainly change in the future.

WHAT TYPES OF INFORMATION COULD THE NETWORK PROVIDE THAT BUSINESS SCHOLARS NEED?

- information about the specific threats posed by companies and industries: geographic location species threatened, and extent of the threat; company activities posing the threat, alternative actions which could reduce or eliminate the damage; governmental actions and policies influencing this situation; any available information on markets of the products generated

- information about companies and industries actions regarding governmental policies related to biodiversity (e.g., lobbying, lawsuits, etc.)

- information regarding exemplary company actions designed to reduce negative impacts on biodiversity

- information regarding economic opportunities and incentives conducive to protection of biodiversity

This is of course only a preliminary list, and additions to it are welcome.

6.18 GUIDE TO INTERNET/BITNET

Contributed by:

Eng-leong Foo, Karolinska Institute, Stockholm, Sweden
Unesco Microbial Resources Center & Dept of Bacteriology
Tel: 46-8-7287147 Fax: 46-8-331547
email: eng-leong_foo_mircen-ki%micforum@mica.mic.ki.se

"Bill" Drew <DREWWE@snymorva.bitnet> from State University of New York, College of Agriculture and Technology, has just sent me his latest update of an excellent compilation: "A Guide to Internet/Bitnet Resources in Agriculture and Related Sciences" .

It contains descriptions of :

(i) INTERNET/BITNET Tools (GOLD-MAIL, MAIL, FTP, TELNET)
(ii) access information to Library databases, bulletin boards,etc
(iii) Mail based services (Almanac Servers, Listserver Discussion groups related to agriculture) and
(iv) other important services e.g. WAIS, FEDIX

Bill's Guide has info on databases that could be added into the database on biodiversity databases and the database on Lists/Conferences/BBS.

For a copy of the Guide, pls contact Bill.

6.19 CDC's

Contributed by:

Preston D. Hardison
Department of Psychology NI-25
University of Washington
Seattle, Washington 98195
Tel: 1 206 527 0119
pdh@u.washington.edu

I have received the mailings without problems. I am a graduate student in evolutionary biology at the University of Washington, and am interested in working to establish networks for the public exchange of data. The kinds of models that I have in mind are the Nature Conservancy's Conservation Data Centers and the bionet conferences on usenet for exchanging information.

In the TNC model, local information is collected at local nodes, which transmit their data to a clearinghouse, which then sends a compiled master copy back to the nodes. However, their software and data is proprietary in Latin America, and there is only one center per country. The CDCs are also not connected to electronic networks. This can lead to a concentration of power and control over the management of biodiversity. I would like to see the process democratized to bring more players to the arena by using networks to help build public access, public domain databases relating to biodiversity, that are distributed to many localities rather than being managed at a few.

6.20 INTERNET CONNECTIVITY NOT AVAILABLE TO ALL YET

Contributed by:

Micah Krichevsky
Biocomm International
E-mail: BT North America 42:CDT0002

I would like to comment on Joe Hanus' very supportive message. The basic observation that many of the deficiencies in browsing and finding information in the INTERNET universe are being solved seems true. There are still problems for the "will nots" that need to be addressed but I will not go into detail here.

The view that the problems of the "have nots" are solved and the need for hard wired gateways is over deserves some comment as this is an important consideration for a biodiversity system.

As Joe says "The only requirement is an Internet connection." Therein lies the rub. Internet connections are not readily available to all. To gain full Internet capacity requires high speed dedicated telecommunication lines. Since I have just left NIH, I have become personally and painfully aware of the lack of simple connectivity to INTERNET. (Lest all reading this shed a tear in sympathy, I am solving the problem to some extent at least insofar as work days is concerned.) However, two aspects of my work habits will not be satisfied and would not even if I remained in the NIH environment.

First, I am denied access to the full complement of high speed access to INTERNET from my home. If I choose to buy a higher speed modem at a cost of US$475 (U.S. Robotics V.32bis Sportster; 14,400 bps supports V.42 and V.42bis) I can communicate with NIH's UNIX platform from home.

Second, and more important to the considerations of the Workshop, I still will not be able to communicate as I travel around the world. Extrapolate this to field conditions for biodiversity studies and studiers. We still have a long way to go in terms of personal connectivity for persons in developing nations and smaller institutions in developed nations. Unfortunately, there remain many scientists and technologists and many more policy makers, administrators, public interest groups, etc. who will be left out of the INTERNET universe for some time to come.

By the way, just one comment on "intuitive" search strategies. I have been involved in designing and teaching short courses for microbiologists in using computers in various parts of the world. Believe me when I tell you that there is no such thing as a universally intuitive anything. The students will interpret instructions in a perfectly logical but unintended manner no matter how clear the instruction appears to the instructor.

The main point of all of this is that those who work in the rarefied and well endowed econiche of the power user often do not have access to the milieu of the vast majority of potential users. Even at NIH not all buildings are yet connected to the backbone high speed network which fact escapes the immensely talented systems team that put the system together.

We must keep in mind (and I know from writings the MGD does) that we will have to cope with "have nots" for some time to come. Perhaps digital radio will short circuit some of

these problems in remote locations. This could be the subject of another discourse. Interesting technology for field use! Cheap and solar powered.

6.21 GLOBAL BIODIVERSITY STRATEGY and LIFE SUPPORT: CONSERVING BIOLOGICAL DIVERSITY

Contributed by:
Anthony Whitworth: E-mail anthony@igc.org

'Global Biodiversity Strategy' has a emerged as a significant and frequently cited volume during the face-to-face workshop.

World Resources Institute. Global Biodiversity Strategy: Guidelines For Action To Save, Study, And Use Earth's Biotic Wealth Sustainably And Equitably (244 pp., 28 cm, $19.95, ISBN: 0-915825-74-0).

Order from WRI Publications, P.O. Box 4852 Hampden Station, Baltimore, MD 21211. Tel: 1-800-822-0504. Shipping and handling is $3.00 for the first copy and .60 for each additional. All orders must be PREPAID. Visa and Mastercard accepted.

Please do not send your order to 'wri@igc.apc.org'. The mailorder house and the World Resources Institute are at different locations.

Also of interest should be 'Life Support: Conserving Biological Diversity', recently published by the Worldwatch Institute, a Washington D.C.-based policy research organization. This 62 page booklet from the "Worldwatch Paper" series, is available for US$5.00 plus US$3.00 postage & handling. Order through email from 'worldwatch@igc.apc.org'.

6.22 MICROBIAL GERMPLASM DATABASE Information

Contributed by:

Joe Hanus| E-MAIL hanusj@bionette.cgrb.orst.edu
Microbial Germplasm Database|
Dept. of Botany and Plant Pathology| Tel: 1 503 737 5300
Oregon State University| Fax: 1 503 737 3045
Corvallis, OR 97331-2902|

Title:	MICROBIAL GERMPLASM DATABASE
Category:	database
Type of access:	public
Cost:	free
Location:	Dept. of Botany and Plant Pathology Oregon State University Corvallis, Oregon 97331-2902 USA
Contents:	Information on holdings in individual research oriented collections of laboratories involved in plant related research. This includes a broad spectrum of scientists ranging from those involved in sustainable agriculture, to systematists, plant breeders, molecular biologists, plant-pathologists and those involved in biotechnology.

How to access: MGD is under construction at this time. Limited access to beta-testers should occur in the next month. Public access will be through (1) Email utilizing Almanac, an information server developed at Oregon State University; and (2) interactive querying using Wide Area Information Server (WAIS) technology and Gopher (a browsing oriented tool developed at Un. of Minnesota. Both, WAIS and Gopher provide internet access to information stored on virtually any platform and in most formats, including text, image, and, should the need arise, sound. The email access is open to persons on any of the networks, including bitnet, Compuserve, and any net gatewayed to internet. Telephone modem access will also be provided.

Contact Person: Prof. Larry Moore
Dept. of Botany and Plant Pathology
Oregon State University
Corvallis, OR, 97331-2902
USA
Voice phone: 503/737-5306
FAX: 503/737-3573
Email: moorel@cgrb.orst.edu

6.23 FISH BIODIVERSITY

Contributed by:

Paulo A. Buckup: E-mail - mvelho@pennsas.upenn.edu

Here is the NEODAT entry for the database on databases for the Biodiversity Network Workshop:

TITLE:	NEODAT - Inter-Institutional Database of Fish Biodiversity in the Neotropics
CATEGORY:	database/GIS
COST:	free (NSF/AID supported)
LOCATION:	Academy of Natural Sciences of Philadelphia, Pennsylvania, U.S.A University of Michigan Museum of Zoology, Michigan, U.S.A.
CONTENTS:	Catalog data from fish collections in South, Central, and North America, as well as Europe. Original type locality data for all freshwater Neotropical freshwater fishes.
HOW TO ACCESS:	e-mail: sschaefe@pennsas.upenn.edu mvelho@pennsas.upenn.edu Tel: 1 215 2991124 Netware TCP/IP via Internet: available through University of Michigan Museum of Zoology (UMMZ, William L. Fink) regular mail: Department of Ichthyology Academy of Natural Sciences 1900 Benjamin Franklin Parkway Philadelphia, PA 19103-1195

Please note: Current access is limited as NEODAT is a three-year project still in it's first year. Currently available data includes ANSP, MCNG, MCZ, UMMZ, UNAM. As hundreds of thousands of additional records become available from numerous other participant institutions, we will announce direct accessibility to NEODAT records. In addition to dial in communications, copies of NEODAT will be distributed to selected Central and South American participating institutions.

6.24 NSF GRANTS MAILING LIST

GRANTS is a mailing list for the discussion of topics related to NSF Grants. As a service to Grants readers, informative messages such as this are also periodically posted. To get on or off the list, or for additional information about the list, send a message to:

grants-request@nsf.gov (Internet)
grants-r@NSF (BITNET)

6.25 NON-INTERACTIVE DATA RETRIEVAL BY E-MAIL

Contributed by:

Sidnei de Souzasidnei@bdt.ftpt.ansp.br
Base de Dados TropicalBT North America 42:CDT0360
Fundacao Andre ToselloTel: 55 192 427022
Fax: 55 192 427827

Among the various limiting factors that inhibit the access to information, the most common are cost and technical factors, such as access to rapid lines for on-line search, and the number of different softwares used (often complicating the life of users).

With the aim of overcoming these difficulties, using the experience acquired with its users, the BDT (Tropical Data Base) decided to work on an interface that would allow the access to it's databases through electronic mail. This experience proved to be very interesting and successful, and for this reason we wish to share it with others.

The main idea was to make the on-line databases available to users of different systems that have e-mail. Users send a message to the database server with specific instructions as to the database and keywords to be searched. As an answer, the user receives an automatically generated message with the result of his/her query.

It is obvious that some rules must be obeyed and specific instructions must be followed to make this possible.

The following example illustrates how the dbserver works:

Someone with access to e-mail, wishes to know who in Brazil works with phytopathogenic bacteria. This person sends the following message to:

dbserver@bdt.ftpt.ansp.br
use bacter
search phytopathogenic
scan
end

Where "use bacter" selects the database of your choice, in this case it is 'bacter' (National Catalogue of Bacteria), "search phytopathogenic" specifies the keyword you wish to be searched, "scan" scans the titles of the pages found, "end" ends the session.

After you receive the answer, you may send another message either refining your search or reading the files that were found. For example:

use bacter
search phytopathogenic
read
end

There are many more facilities available, such as the possibility of restricting the size of the message, requesting that the messages be compressed, requesting help, among others.

It is easy to see that the great disadvantage of this system is time, since it is obviously much slower when compared to on-line interactive searching. When time doesn't present itself as a problem, there are advantages, such as cost, which is greatly reduced, and the fact that the information is made available to all users that have e-mail facilities (Bitnet or Internet), regardless of which hardware or software they use.

We believe that this experience may be interesting to explore when designing a biodiversity network, since it considers the lack of technical and financial resources of developing nations.

If you wish to receive more information on the dbserver at BDT, send a message to dbserver@bdt.ftpt.ansp.br with the word help as text. The subject is ignored by the system.

6.26 TAXACOM

Contributed by:

James H. Beach beach@huh.harvard.edu
Data AdministratorTel: (617) 495-1912
MCZ, Herbaria, Arnold Arboretum Fax: (617) 495-9484
22 Divinity Avenue
Harvard University
Cambridge, MA 02138, USA

>From @pucc.Princeton.EDU:TAXACOMT@MSU.BITNET Sat Jul 18 09:37:23 1992

The Taxacom FTP server is accumulating project descriptions and technical documentation for systematics/biodiversity database software and database development initiatives.

Recent additions include files describing the computerization of the Harvard Gray Card Index (newly described western hemisphere plant species), information about the MUSE project based at Cornell and about MUSE collection database software, newsletters from ERIN, the Environmental Research Information Network of Australia, NEODAT - a new world collaborative fish collection database catalog effort, among others.

The files are located in self-evident subdirectories under /pub/. The Taxacom FTP server can be reached via anonymous FTP at huh.harvard.edu (128.103.108.123).

6.27 TAXACOM FTP SERVER LISTS

The contents of the Taxacom FTP Server include:

taxacom.txt A description of the Taxacom Listserv lists: taxacoma@msu.bitnet and Taxacomt@msu.bitnet.

taxacom2.txt Is additional technical information on the Listserv program for the technically inclined.

pto The most recent version of Plant Taxonomists Online, the E-mail directory of plant taxonomists and herbaria.

flora.online Is a subdirectory containing all of the issues of the Journal Flora Online in compressed ZIP format. The decompression program PK110.EXE is also available in the subdirectory. Be sure to use the "binary" or "image" option with FTP when downloading these files.

delta Is a subdirectory with the most recent DELTA package from M.J. Dallwitz. These are MS-DOS programs stored here in compressed ZIP format. See the explanation under the "miscellaneous" directory below on how to obtain and use the PKUNZIP program to un-compress the DELTA program files. This latest DELTA version was supplied by M.J. Dallwitz on May 20, 1992.

labels3 Is a subdirectory with the most recent versions of the LABELS3 dbase source code for dbaseIII+ and dbaseIV. (Labels33.exe and Labels34.exe, respectively) Also included are the dbaseIII and dbase IV source code for EZLabels, a simpler version of Labels3, file names are Ezlab33 and EZlab34 for the dbaseIII+ and dbase IV versions. (From John H. Beaman, Michigan State Univ.)

beanbag Is a subdirectory of issues of the Bean Bag - a special interest newsletter for legume researchers.

library Is a subdirectory containing listings of internet-accessible library catalogs and university campus information systems. Files "uslibs.txt" and "uslibs.ps" are listings of primarily U.S. libraries but with a few other countries as well, the files are ASCII and Postscript respectively. The file "uklibs.txt" lists United Kingdom library systems which are searchable through an NSFNET-JANET gateway.

funding Is a subdirectory of funding opportunity announcements and related information on sources of support for biological database and database system development.

miscellaneous Is a subdirectory of miscellaneous utilities including PKZ110.EXE a self extracting archive file which produces the MS-DOS programs PKZIP and PKUNZIP for compressing and decompressing files in the *.ZIP format. To use PKZIP or PKUNZIP on your DOS PC, FTP this file in FTP binary mode (specify "binary" at the FTP prompt before using "get"), then type PKZ110 at the DOS prompt. Instructions will

be generated then. Use PKUNZIP to decompress the Flora Online articles found on this server.

networks — Is a subdirectory with various networking-related files. It contains HYTELN11.ZIP a compressed (ZIP) file containing a memory-resident DOS utility which pops-up network database address and access information. Very nice. Use the PKUNZIP program to decompress the file, after you FTP it in BINARY mode to its own subdirectory on your PC. See "miscellaneous" above for the PKUNZIP program. Also included is "The Zen of the Internet," an excellent introduction to research networking, a postscript file.

mvsp — A subdirectory containing MVSP - A Multivariate Statistical Package. It performs ordination, cluster analyses and calculates diversity indices. Can graphically display results with CGA, EGA, VGA, and Hercules video adapters. Free. MS-DOS program stored in ZIP format. Use the FTP "binary" option to copy, then PKUNZIP to create the program files.

iwgtdps — A subdirectory of draft standards and related documents of the IUBS Commission for Plant Taxonomic Databases (otherwise known as "TDWG" after the group's earlier name the "Taxonomic Databases Working Group."

workshops — A subdirectory containing the reports of NSF-sponsored workshops on scientific computerization. File formats vary, depending on what is made available to us by the workshop organizers.

iso — A subdirectory of ISO standards (as we find them).

plant.names — A subdirectory of files containing the names of plant taxa being considered for special nomenclatural status under the Names in Current Use Initiative of the IAPT. The data files are arranged in subdirectories according to the major groups of plants. See the README files there for more information. Last update: 5 Nov 1991.

maildata.srv — An ASCII document describing the operation of an E-mail data server for plant specimen information. The server is currently available to query a 16,000 record database of plant specimens collected from Mt. Kinabalu, Sabah, Malaysia; the complete holdings of the herbarium of the W. K. Kellogg Biological Station of Michigan State University, and the mint (Lamiaceae) type specimen holdings of the Harvard University Herbaria. The E-mail server returns specimen record meeting keyword query criteria sent to it within a standard mail message. We plan to use it for additional specimen and authority (reference) file information. [Jim Beach, beach@huh.harvard.edu]

muse — A directory containing information on the MUSE project and MUSE collection database software, from Julian Humphries, Cornell University, Email: lqyy@vax5.cit.cornell.edu

iopi — A directory of information from the International Organization for Plant Information.

erin — A directory of newsletters in postscript format from the Environmental Resources Information Network, an Australian remote sensing and environmental monitoring agency. Interesting and nicely produced.

hispid — A directory of documents describing data standardization efforts being undertaken by Australian herbaria.

smasch — A directory for documents describing the SMASCH project of the California Herbaria. SMASCH is an herbarium collection cataloging project based on X Window technology utilizing Sun workstations and UC Berkeley's Imagequery software. [Nothing here yet - contact: Dr. Thomas Duncan, tdunc@buttercup.berkeley.edu, Telephone: (510) 642-6992].

graycards — A directory containing project update information on the computerization of the Gray Herbarium Card Index at Harvard University. The Gray Index has tracked the publication of newly discovered western hemisphere vascular plant species for over 100 years. It is being converted from card catalog and fiche records to an network accessible database during 1992.

neodat — A directory of newsletters from NEODAT a new world fish database project being collaboratively developed by 25 western hemisphere institutions.

6.28 EUROPEAN PLANT INFORMATION CENTRE, THE NATURAL HISTORY MUSEUM, LONDON.

Charlie Jarvis44 71 938 9464
Bob Press 44 71 938 9488
Marian West 44 71 938 9260
Facsimile: 44 71 938 9260

Department of Botany, The Natural History Museum, Cromwell Road, London, SW7 5BD, U.K.

A new facility, the European Plant Information Centre (EPIC), has been established at the Natural History Museum. The Centre, set up in January 1991, will provide a service that can meet the need for basic taxonomic and distributional information, and provide specialised outputs using a variety of analytical procedures. To achieve this the Centre will develop computer databases for the vascular and non-vascular plants of Europe, the Mediterranean Basin and Macaronesia. Taxonomic, bibliographic and geographical data will be supported by specimen information. Recognising the need for precise information on threatened plants, the Centre's first priority is to map the distribution of threatened and endemic plants in Europe. In collaboration with the World Conservation Monitoring Centre (WCMC), a geographical information system (GIS) has been installed. A pilot project has been started which will map the plants listed under the Berne Convention as threatened in Italy. International collaboration is essential in such a project and we are delighted to have the active participation of the Botanical Museum of the University of Florence under its Director, Professor Guido Moggi. A project is also under way to map the flora of Crete, data are being prepared on the flora of Madeira, and further collaborations are under discussion.

The Museum houses 67 million specimens, including 6 million plant collections, of which a third are from Europe. Establishing a specimen database is a major undertaking. The Centre will acquire specimen information from its mapping projects and from existing databases, such as catalogues of type specimens. The head of the Centre is Dr Charlie Jarvis, who also leads the Linnean Plant Name Typification Project, and is joined in the new project by Bob Press and Marian West. Ron Miller of WCMC is closely involved in the development of conservation-related projects.

The Museum has made a significant commitment of resources to the development of the Centre and is seeking funding and collaboration for future projects.

6.29 CROSS POSTING MESSAGES

Contributed by:

Eng-leong Foo, Karolinska Institute, Stockholm, Sweden
Unesco Microbial Resources Center & Dept of Bacteriology
Phone: 46-8-7287147 Fax: 46-8-331547
email: eng-leong_foo_mircen-ki%micforum@mica.mic.ki.se

There is an observation which I would like to bring to your attention. This is cross posting of messages. An excellent example: TROPINET, a quarterly, is distributed in its electronic form by a list CONSLINK and also available as a file which can be obtained via an email request to the listserv.

Tropinet Vol.3.Nr.2. (37k or 13 pages) was cross posted also in

(i) GLFR92-L (by cafonso)
(ii) BIODIV-L (by dora)
(iii) biodiv.news (by consdesk@igc.apc.org)

I am a member of all 4 lists.

This is definitely something for the OUTREACH WG to consider, i.e. in cooperation with other managers of biodiversity lists/conferences (Anthony, Afonso, Michael, Dora, and others) develop a series of lists which will facilitate and direct users to appropriate lists. The process of development is much like the directory of databases which BIN21 has as its goal.

May I suggest the creation of an initial PRIVATE list for the OUTREACH WG for some brainstorming or has there been other approaches on how to get started?

6.30 PATENTING

Contributed by D Lange, BDT: e-mail - dora@bdt.ftpt.ansp.br
BT North America 42:CDT0094

One of the great issues during the Earth Summit concerning biodiversity was patenting. I received this information from another list, and it was sent by a department within the CNPq (Brazil). E-mail: dct@cnpq.andf.br

ICSU STATEMENT ON GENE PATENTING

The INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS (ICSU) is an international non-governmental organization whose mandate includes the promotion of cooperation in the basic sciences, and the safeguarding of the principle of the universality of science and of the free flow of scientific knowledge.

The Council is aware of the tremendous potential benefit of genetic research for humanity and realizes that new ethical and social dimensions arise from this. Accordingly, ICSU strongly believes that efforts to patent genetic information should not jeopardize either progress in the basic sciences or access to the information which is necessary for such progress to continue.

ICSU asserts its view that information about nucleic acid sequences cannot be patented per se. Such sequences should be patentable solely within the context of their demonstrated significance and/or application (e.g. regulatory signals, antisense RNAs, probes, etc...) -- and not of their POTENTIAL products (e.g. proteins) -- and provided that this can be shown to be "novel", "non-obvious" and "useful". Under such circumstances, patenting of complementary DNA sequences (cDNAs) would distort the patent process, which is designed to protect applications, methods and products, on the basis of proven facts and not mere expectations, and normally serves society by stimulating the investments and developments necessary to provide useful products and services. Any deviation from such patenting principles would run counter to best interests of science and hinder international collaboration in such endeavours. ICSU therefore cautions against decisions which may be irreversible, such as those possibly emerging as a result of the recent patent requests concerning complementary DNA (cDNA) sequences corresponding to portions of unknown messenger RNAs (mRNA).

ICSU urges the relevant authorities, particularly in countries where patent applications in this field have been or are soon to be filed, to consider such applications taking due account of the possible implications and to ensure a strict application of established patenting principles, thereby setting an example for other countries in which similar cases may arise in the future. ICSU would welcome a formal international agreement on this subject.

Paris, June 1992

6.31 INVITATION INTEREST FROM DAVIS, CALIFORNIA

Contributed by:

Dr. G.A. Wandesforde-Smith
Department of Political Science
University of California
Davis, CA 95616-8682 Tel: 1 916 7523077. Msgs. 752-0966.
E-mail: gaWandesfordeSmith@ucdavis.edu Fax. 752-8666.

Dear Colleagues,

Attached is an invitation for interested persons and institutions to participate in the development of a global Biodiversity Information Network. This initiative is a direct outgrowth of the Rio Earth Summit. I draw your attention particularly to paragraphs four and five of the message below, and most especially paragraph five.

This summer, here at UC Davis, we have pioneered new developments in automated networked information services for research and teaching. These all grow directly out of campus strength in environmental studies. One outgrowth of this work is CentRED, which will come into use by students during the Fall Term. Another is the arrangement we have negotiated with the President's Council on Environmental Quality for on-line publication of the national report to UNCED. Still another is the ongoing encouragement we have tried to provide for the UNCED Secretariat and IGC to take seriously and move ahead with the archiving of on-line UNCED materials, which played an important role in the history and conduct of the Rio Conference, and which continue to shape post-Conference events -- witness the Biodiversity Information Network itself.

It has become clear that the creation, maintenance, and sustenance of large, on-line databases, as supplements to traditional library and archival resources, is emerging as an important new endeavour for world-class universities and research institutions.

My assessment is that we are sufficiently close to the cutting edge of this rapidly evolving field of information technology to warrant, at a minimum, staying in close touch with those who are developing the Biodiversity Information Network. Since this is a University with major evolving strengths in automated networked services, as well as an established reputation for excellence in many, many aspects of biodiversity research and teaching, broadly defined, you may want to go further and ask whether UC Davis might not be in a position to make a major contribution here.

Geoffrey.

[THIS MESSAGE WAS FOLLOWED BY THE BIN21 PRESS RELEASE. Ed.]

6.32 PLANT ECOLOGY EXPERT DATABASE

Contributed by:

Anthony Whitworth <awhitworth@igc.apc.org>

The doctoral (postgraduate) education is being developed and organized in several fields of science at the Universities of Finland. In plant ecology, the programme for doctoral education is coordinated by the Department of Botany at the University of Oulu and the project is financed by the Ministry of Education. Since the importance of the international cooperation between Universities and Research Institutes at the postgraduate level is well emphasized we are creating an international database for experts in PLANT ECOLOGY, where experts/research institutes/university departments can easily be reached on the basis of the key words for example. For that purpose, could You please distribute these database forms to the experts in plant ecology at Your University/Institute. Forms can be send back to: Anne J{k{l{niemi, [a name incorporating Finnish characters, probably. Ed.] Department of Botany, University of Oulu, SF-90570 OULU, FINLAND, faxed: + 358 81 353266, or emailed: kasv-aj@finou.oulu.fi.

With best wishes,

Anne J{k{l{niemi
Coordinator of the Postgraduate Program in Plant Ecology

NAME:_____
PRESENT
POSITION:_____
INSTITUTE:_____
ADDRESS:_____
_____
_____
TEL:_____
FAX:_____
E-MAIL
ADDRESS:_____

EDUCATION:_____
_____
_____

PROFESSIONAL
EXPERIENCE:_____
_____
_____
_____

RESEARCH AND EXPERTISE
(KEYWORDS):_____
_____
_____
_____

RESEARCH AND EXPERTISE (FREE FORM):_____

_____

_____

_____

_____

LINGUISTIC ABILITY (NATIVE AND OTHERS):_____

_____

REMARKS:_____

_____

Send form to: Anne J{k{l{niemi, University of Oulu, Department of Botany, Linnanmaa, SF-90570 OULU, FAX: +358 81 353266

6.33 AUSTRALIAN BIOLOGICAL RESOURCES STUDY

Contacts: Helen Hewson (flora)fax: +61-6-2509448
Jean Just (fauna)

OVERALL AIMS AND OBJECTIVES OF THE ABRS

ABRS aims to answer two questions:

By coordination and liaison the ABRS aims to provide a national focus for the documentation of biodiversity. To achieve this coordination the ABRS assists in the development of facilities, expertise, and improved and increased taxonomic research available in State and other institutions and does not duplicate those functions at a national level. This is done by means of a grants scheme. This Participatory Programme is the core of the ABRS activities.

While the majority of grants are made to Australian scientists, some funds are provided to overseas workers with special expertise not available in Australia. Where possible the programme aims to develop Australian expertise by the use of overseas workers to train Australians.

The results of this impetus are being published in a series of handbooks, or developed as computer databases.

ARBS PUBLICATIONS

The Zoological Catalogue of Australia serves as a comprehensive bibliographic and computer-based source of available taxonomic and biological information for each species of the Australian fauna. The database will progressively be made available via a range of communication systems and will be updated as new information becomes available. It will be possible to computer-search the database to provide specific information of interest to a wide variety of specialists. Sections of the database are also published in book form. Approximately 80 volumes are planned.

Nine are published. The Fauna of Australia will be a major reference source for scientists, fauna authorities, students and amateur naturalists. The series will present a comprehensive account of the current knowledge of the biology, taxonomy, evolution and history of discovery of the animals which live in Australia in 10 volumes. One volume in two parts is published. The Flora of Australia, a series of approximately 60 volumes, will describe all the native and naturalized plants found in Australia and its Territories. There are keys for identification, notes on distribution and bibliographic information. Many species are illustrated by line drawings and volumes include colour photographs and a frontispiece which reproduces an original painting of a species from the volume.

Volume 1, published in 1981, contains chapters on the history and purpose of the Flora of Australia project, the origin and evolution of the Australian flora and the systematic arrangement of plant families. It includes a key to families of flowering plants and a glossary of botanical terms. Twelve volumes are published.

ABRS LISTS AND DATABASES

The ABRS is also developing comprehensive national lists of the current scientific names of plants and animals. Each list is planned to become a subset of a larger taxonomic information system.

The Australian Plant Name Index (APNI), an index of all scientific names that have been applied to Australian seed-bearing plants and ferns, was published in June 1991. For each generic, infrageneric, specific and infraspecific name, the Index lists the original place and date of publication of the name, its typification and nomenclatural status. It also cites recent revisions where the name has been used. At present, the Index contains over 62,000 names. It is held on a computer file and this is being developed to make on-line access to the information as easy as possible. The Index provides much of the background information necessary for taxonomists who are writing for the Flora of Australia or doing revisionary and monographic studies on Australian plants. It is also a useful source of information for ecologists, horticulturists, conservationists and others needing information on the nomenclature and taxonomy of Australian plants.

The Census of Australian Vascular Plants (CAVP) will form part of the Australian Plant Name Index database. Compiled from data supplied by major Australian herbaria and where possible checked by specialists, it is a list of all accepted species and infraspecific taxa on the Australian mainland and Tasmania. Distributions given in a system of regions within the States and the Northern territory. The Census lists 17,548 species and some 2,000 infraspecific taxa, including native and naturalised species. The editing of the Census revealed much less stability in currently used plant names than had been anticipated. The CAVP is now maintained and updated by staff of the Australian National Botanic Gardens.

The Census of Australian Vertebrate Species (CAVS) is a list of scientific and common names along with the State distributions of all described species of amphibians, reptiles, birds and mammals found in Australia. This list was established at the request of the Council of Nature Conservation Ministers (COMCOM). An updated list, available in printed or electronic form, may be obtained on request. The list is updated at regular intervals in consultation with the staffs of State museums.

Another zoological list is ecologically based. It is the Rainforest Animals: Atlas of Vertebrates Endemic to Australia's Wet Tropics. This exiting book, co-produced by ABRS and Centre for Resource and Environmental Studies, Australian National University, was published as Number 1 in Kowari in 1991.

Other taxonomically based lists are either being developed or are to be converted into database format. One such is The Catalogue of Mosses of Australia and its External Territories.

6.34 CONSLINK, SEACNET AND OTHER LISTS

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I am much impressed by the number of SEACnet lists and would appreciate if Josh Knauer could post into BIODIV-L a listing of the SEACnet lists and their titles (and if available, a short summary on the scope of each list).

Information:

CONSLINK@SIVM has a file on "Register of Environmental Organizations" containing addresses of 134 organizations but lacking in phone, fax or e-mail addresses. This list would be a good starting point for the Biodiversity Network's directory of organizations. To get a copy of CONSLINK's register, address your e-mail to < listserv@sivm > with the command GET CONSLINK NGOS.

Database on Lists/Conferences/BBS on Biodiversity

Here are 3 more that might be of interest:

MARINE-L@UOGUELPHMarine studies/Shipboard education discussion
MEDSEA-L@AEARNMarine biology of the Adriatic Sea
PETS-L@ITESMVF1Domestic animal care and education list

There exist numerous conferences and bulletin boards on systems (MSDN, COMPUSERVE, etc.) which are ONLY available to registered users. It would be useful for Biodiversity Network to establish cooperation with the organizers of these activities. Another good contact is Mr. Carlos Brefe (now in U.K.) who is finishing his MSc course in September and then joining BDT as an information officer. He will have a chapter in his dissertation on lists for bioscience topics.

Though I initiated this effort to collect information, I wonder if there is any intentions by the Biodiversity Network to create such a database to store the collected information. There is currently NO DATABASE which includes conferences and BBS. A database with an e-mail server would certainly be useful.

6.35 INTERNATIONAL COUNCIL FOR BIRD PRESERVATION

Colin Bibby, Research Director
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ICBP is a worldwide partnership of organization using birds as spearheads for concern and action for biodiversity conservation and its contribution for humanity. It works on research, practical conservation and network development throughout most of the world.

ICBP believes in the value of collaboration and wishes to develop its contribution through efficient partnership with like-minded organizations. It especially wants to develop greater national strengths and will in 1993 launch a new federal structure to further this.

ICBP makes its distinctive contributions in three areas:

1) Development of global biodiversity conservation priorities.

ICBP's contribution - Putting Biodiversity on the Map: Priority Areas for Global Conservation (1992) - is the first global analysis of distribution data on any extensive group of animals. Our Red Data Book Program, Bird Specialist Groups and Bird families; Action Plans complement this distributional data analysis, further pin-pointing specific sites and their conservation requirements. Therefore, because birds are better known than all other vertebrate groups they provide a particularly practical and effective contribution to propose conservation measures, evaluate the effectiveness of ongoing conservation actions, and to monitor sustainability of environmental use.

2) Development of national non-governmental organizations (NGOs).

NGOs have a vital role to play in mobilizing public support and private and governmental conservation actions. They also further and influence environmental agendas such as the Biodiversity Convention. As shown by the strength of NGOs in various countries (such as RSPB in Britain, or the National Audubon Societies in various countries), birds are the most successful wildlife group to focus the motivation of popular interest in wildlife and conservation. ICBP has been particularly successful in strengthening and uniting organizations in Europe as an effective lobby for conservation, especially through our "Important Bird Areas in Europe (1989)" Program, and further work in progress. We can use this proven model of network development to assist with the same challenge elsewhere in the world: we are already strengthening conservation efforts in Asia and the Americas through our regional offices which closely with network members to promote habitat protection of the global priority areas that they have helped identify.

3) Development of a conservation programme.

ICBP believes that the development of research and of networks is most effective in the hands of organization with a practical program. In this way, there is less risk of research

contributions lacking practical application. ICBP will therefore seek to base the development of nation NGO strength on organizations with both scientific and practical conservation programs. Through the federation, program skills can be developed and exchanged to address our global conservation priorities.

Data and computer networking at ICBP

ICBP has extensive data bases but data flows are still largely by means of written and printed material. The bird world is very rich in unpublished knowledge and grey literature. ICBP would be keen to join a global effort to improve biodiversity conservation through better use of knowledge and believes that birds have a valuable contribution to make.

ICBP plans to place the following databases on-line:

1) ICBP's World Bird Database: Listing all world species known to occur, this database contains each species' English and Latin names, country occurrence, indicators on their status (degree of threat) and restricted range bird information. Names in other languages may be added at a future date.

2) European Bird Status Database. Recent population estimates for all European birds and 20 year population trends for all European species.

3) Important Bird Areas Database. Currently, only the European sites, about 2500, have been identified. However, all world sites will be identified by 1998, being available, gradually, by regions (sites to be added after research completion with our networks are: the Middle East, Africa, Asia and the Americas).

Our Endemic Bird Areas Database which contains individual records for restricted range bird species will remain available only through direct inquiries to staff.

Electronic mail to our headquarters will be available November 1992; database accessibility thereafter. E-mail inquiries can be directed in the mean time to either of our following offices:

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APPENDIX 1.

PROGRAMME

Note: Computer demonstrations and evening meetings will be arrranged as requested

Day 1 Monday July 27th

Chair: V. Canhos

9:00-9:15 Welcome (V. Canhos)
9:15-9:45 Introduction (Background to Workshop. Objectives. How Workshop will be run.) (B. Kirsop)
9:45-10:15 Biodiversity after the Earth Summit (J.McComb)
10:15-10:45 COFFEE BREAK
10:45-12:30 ROUND TABLE: COMMUNICATION SYSTEMS AND NETWORKING DEVELOPMENTS
Introductory addresses: S.Souza, D.Jinks, A.Gomide; debates
12:30-14:00 LUNCH

Chair: M. Thorley

14:00-15:30 EXISTING INITIATIVES
WCMC (J.McComb), MSDN (E.Ross), BDT (V.Canhos), NSFNet (L.Krishtalka)
15:30-16:00 TEA BREAK
16:00-18:00 WORKING GROUPS: NEEDS AND SCOPE OF A BIODIVERSITY NETWORK
- animal/plant/microbial needs
- regional needs
- needs for the scientific programmmes
- scope of a biodiversity network
19:00 Cocktail Party

DAY 2 Tuesday July 28th

Chair: J. Prilusky

9:00-9:15 Distribution of online contributions
9:15-9:45 Presentation of Working Group Report
9:45-10:45 EXISTING INITIATIVES
Alternex (C.Afonso), IBPGR (M.Perry), ERIN (D.Jinks)
10:45-11:15 COFFEE BREAK
11:15-12:30 EXISTING INITIATIVES
MGD (L.Moore), BNFnet (E-L.Foo), LSN/BIOSIS (G.MacKenzie), LAABN (L.Giddings, L.Gama)
12:30-14:00 LUNCH

Chair: G. Mackenzie

14:00-14:30 Standardisation of terminology for computerised information: the CODATA Commission (L.Blaine)
14:30-15:30 EXISTING INITIATIVES

SCAR (M.Thorley), CABI (P.Kirk), WFCC (B.Kirsop), EMBNET (J.Prilusky)

15:30-16:00 TEA BREAK

16:00-18:00 EXISTING INITIATIVES
NHM (B.Pitkin), IPBM (S.Lyssakov), EMBRAPA (E.Miranda), IBAMA (B.Dias), WDC (H.Sugawara), SEANET (Y.Park)

DAY 3 Wednesday July 29th

Chair: Paul Kirk

9:00-9:15 Distribution of online contributions

9:15-10:15 ROUND TABLE: COMMERCIAL X NON COMMERCIAL NETWORKS
Introductory addresses - L.Krishtalka, T.Richardson, A.Whitworth, L.Blaine; debate

10:15-10:45 COFFEE BREAK

10:45-12:30 WORKING GROUPS: MODEL FOR A BIODIVERSITY NETWORK
- distributed/centralised/decentralised
- not-for-profit/profit
- economic and administrative implications

12:30-14:00 LUNCH

14:30-16:00 WORKING GROUPS: NETWORKING AND COMMUNICATIONS NEEDS
- communications systems (academic/commercial)
- linking mechanisms
- interfaces
- special needs of remote areas
- data transfer needs

16:00-16:30 TEA BREAK

16:30-18:00 WORKING GROUPS: IDENTIFYING INFORMATION RESOURCES
- 3 working groups:
  Plant: Chair: M.Perry
  Animal: Chair: B.Pitkin
  Microorganism: Chair: E.Ross

DAY 4 Thursday 30th July

Chair: E-L. Foo

9:00-9:15 Distribution of online contributions

9:15-10:30 Reports of previous day's discussion groups

10:30-11:00 COFFEE BREAK

11:00-12:30 WORKING GROUPS: ADMINISTRATION AND FUNDING NEEDS
- coordination of activities, need for task groups
- need for focal point for future developments
- funding needs
- sponsorship

12:30-14:00 LUNCH

Chair: B.Kirsop

14:00-18:00 PLENARY SESSION
Summary of final reports

Discussion and any further contributions
Agreement of Workshop Recommendations
Online demonstrations
20:30 Dinner Party

DAY 5 Friday 31st July

Chair: J. McComb
9:00-9:30 Distribution of online contributions
9:30-10:30 ACTION ITEMS
Task Groups to be established (topics, names)
Communications after the workshop (setting up online system)
Administrative mechanism
10:30-11:00 COFFEE BREAK
11:00-12:00 ACTION ITEMS (cont.),
Press release
12:00-14:00 LUNCH
14:00-17:30 Continuing informal discussions and demonstrations
17:30 Closing statements

APPENDIX 2.

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