SYSTEMATICS AGENDA 2000

CHARTING THE BIOSPHERE

A GLOBAL INITIATIVE TO DISCOVER, DESCRIBE AND CLASSIFY THE WORLD'S SPECIES

"We make a potentially dangerous mistake when we assume that we must choose between serving humanity or serving the environment. It must be a priority to bring these goals into harmony. They need not and they must not be mutually exclusive."

— ORVILLE FREEMAN

Former U.S. Secretary of Agriculture, 1989

THE GLOBAL IMPERATIVE

IMAGINE DISCOVERING A PLANET *that is home to a magnificent diversity of life. Imagine further that investigation of its surface reveals millions of previously undiscovered species — each one of which is potentially valuable to humankind.*

Given the existence and accessibility of such a planet, scientists here on Earth would surely undertake a major exploration of this miraculous new world to discover and document its myriad life forms.

IRONICALLY, THIS ACCOUNT IS NOT SCIENCE FICTION. It is a description of our own Planet Earth — the only planet within our solar system capable of supporting an astonishing variety of life forms which, in turn, provide food, shelter, clothing, and medicine for humanity.

The Earth's species — including humans — comprise an intricate fabric that has shaped the atmosphere, climate, soil, water, and other ecological features essential for the very existence of life. More than 1.4 million species have already been discovered and described by systematic biologists — those scientists responsible for exploring the world's biological diversity.

Documenting new species sets the stage for investigating their relationships to other species and for organizing knowledge into classification systems. These systems, in turn, are powerful predictive tools that help us to understand, maintain, and effectively utilize the great biological wealth we have inherited.

A LARGELY UNKNOWN WORLD

Despite two centuries of research by biologists exploring every corner of the world, there is still much to learn about life's diversity. Millions of species — *perhaps even tens of millions* — remain unknown to us. Yet, these species stabilize the delicate balance of ecosystems and hold great potential for expanding and diversifying our agricultural production, as well as providing new and effective cures for diseases that plague human populations. Because of this vast potential, scientists have a mandate to advance our knowledge about these species. Fortunately, recent achievements in systematic biology offer the prospect of charting the biosphere in a way that will capture the enormous scope of species diversity.

A RACE AGAINST EXTINCTION

As we struggle to unlock the unlimited potential of the Earth's biological diversity, however, many species are in danger of extinction. We are faced with rapidly declining diversity and disappearing habitats worldwide — and an increased demand for precious biological resources by expanding human populations.

Without an immediate exploration of our planet's vast living resources, countless opportunities to understand the natural world and live sustainably with other organisms will be lost. The cost of ignoring species diversity now will ultimately far exceed the cost of investing in its future. We face an unprecedented opportunity — one that our grandchildren will not have, should we fail.

If trends continue, humans will soon live in a biologically impoverished world. With the loss of each species, we lose potential economic benefits — natural products that increase our food supply or the medicines we depend on. We lose links in the web of life that are essential for clean air, clean water, and healthy ecosystems. We also lose clues about the history of the living world — and our place within it.

Our ability to confront problems today depends on years of accumulated systematic research that has documented and analyzed the components of the biological world. Forty years ago, for example, knowledge of groups like viruses was so slight that we would not have recognized those organisms which today cause AIDS and other diseases. Systematic research must now be accelerated dramatically if we are to compete successfully in the race against extinction, and at the same time cope with the increasingly complex problems facing our environment and well-being.

RESPONDING TO AN EMERGING GLOBAL NEED

The future welfare of our biosphere and all of its species — including humans — will depend upon the collective actions of the world's governments over the course of the next few decades.

At the United Nations Conference on Environment and Development in Rio de Janiero in 1992, the world community recognized the need for continued economic growth while maintaining the integrity of the biosphere. Achieving these dual objectives will entail complex political and economic decisions — which must be informed by accurate scientific information about the earth's biodiversity.

In their global action plan, the world's nations underscored this need by calling for increased knowledge about the Earth's species. This knowledge will guide the world's governments in developing and implementing programs that ensure sustainable use of the Earth's increasingly limited resources.

"But now a new challenge — the threat to the global environment — may wrest control of our destiny away from us. Our response to this challenge must become our new central organizing principle."

AL GORE
Vice President of the United States

THE NEXT 25 YEARS

"Reduction in the area of tropical rain forest at the current rate can be expected to extinguish or doom to extinction about half a percent of the species [about 27,000] in the forest each year . . . If destruction of the rain forest continues at the present rate to the year 2022, half of the remaining rain forest will be gone."

— E. O. Wilson, 1992

Over the next 25 years, the global community must resolve to discover, describe, and understand the Earth's species. Theoretical and technological advances have prepared the scientific community of systematists to undertake this daunting task. Given adequate support, this mission can be successfully accomplished — with immediate and continuing benefits to ourselves and our children.

Meeting this challenge is pivotal to our survival and well-being. Basic systematic research on species diversity is urgently needed to facilitate international efforts by natural resource managers, pharmaceutical explorers, conservation biologists, ecologists, and many others. As we learn more about the Earth's biological diversity, we will be better equipped to conserve natural habitats on land and in our lakes, streams, and oceans.

A GLOBAL CALL FOR ACTION

To meet the challenge of comprehending life's diversity, the international systematics community proposes a program of discovery and research called *Systematics Agenda 2000: Charting the Biosphere*.

The prospect of exploration on such a grand scale — with its extraordinary benefits for society — gives this agenda *(SA2000)* unparalleled importance. And now, more than ever before, our attempts to understand biological diversity have a special urgency. The possibility of mass extinction challenges the world community to discover, preserve, and sustainably utilize its species diversity before it is lost forever. ●

SYSTEMATICS: THE SCIENCE OF BIODIVERSITY

HUMAN BEINGS SHARE THE EARTH with millions of other species, whose varied forms and complex interrelationships have evolved over several billion years. Systematics is the science dedicated to the discovery, organization, and interpretation of this diversity. Systematic biologists constitute a global network of scientists dedicated to, and specially trained for, the study of species diversity.

Systematic knowledge unifies all areas of biology by establishing a conceptual framework for interpreting the properties and activities of organisms. Classifications developed by systematists integrate comparative information about species across a diverse number of fields — ranging from molecular biology and the health sciences to ecology and resource management.

Although our knowledge of the Earth's species is far from complete, new methods of analysis, combined with direct access to genetic material (DNA), powerful technologies for processing information, and expanding natural history collections, now provide the foundation needed to increase our understanding of biological diversity on a global scale.

WHAT IS SYSTEMATICS?

Systematics is the science dedicated to discovering, organizing, and interpreting biological diversity. It consists of the following tasks:

TAXONOMY
The science of discovering, describing, and classifying species or groups of species (collectively termed "taxa").

PHYLOGENETIC ANALYSIS
The discovery of the evolutionary relationships among a group of species (termed a phylogeny).

CLASSIFICATION
The grouping of species — ultimately on the basis of evolutionary relationships.

WHY IS BIODIVERSITY IMPORTANT?

WHY SHOULD WE BE SO CONCERNED about the loss of biological diversity? In fact, given the life-sustaining importance of the Earth's species, it is remarkable that this question even arises so often. Most simply, species contribute to human welfare and well-being in three ways:

ECOLOGICAL SERVICES

Millions of the Earth's species interact with one another and with their physical surroundings to form a complex ecological web that ultimately sustains all life. These interactions ensure clean air and water, produce fertile soils, and play a regulatory function for the Earth's geochemical cycles.

SPECIES ECONOMICS

The use of tens of thousands of species by people everywhere provides food, shelter, health, and other commodities, thus driving the world economy. Trillions of dollars are earned each year through the use of species in agriculture, forestry, fisheries, pharmaceuticals, textiles, and nature tourism. All people benefit either from the use of traditional medicines or from pharmaceuticals that rely on technological manipulation of species and their products. The relative numbers of species that have been put to use by humans is extremely small, yet the potential for other species to make a comparable economic contribution is enormous.

THE HUMAN SPIRIT AND INTELLECT

Throughout history, humans have exhibited curiosity about the natural world. The diversity of the Earth's organisms invites us to seek answers to questions that help define the human consciousness and intellect. The search for solitude or comfort in nature is deeply imbedded in the human spirit, which is why the ethical and religious beliefs of so many cultures foster a reverence for life in all its forms and encourage us to adopt a stewardship role to preserve and protect our natural surroundings.

LOSING A SPECIES: DOES IT MATTER?

The rosy periwinkle (*Catharanthus roseus*) is native to the island of Madagascar. This plant had a following in folk medicine as a treatment for diabetes. Upon further study, extracts were discovered that reduce white blood cell counts and depress bone marrow activity in laboratory animals. These observations led to the isolation of two products, vinblastine and vincristine, which have been successful in fighting leukemia. Since these drugs were first marketed, childhood leukemia survival rates have increased from 10% to 95%.

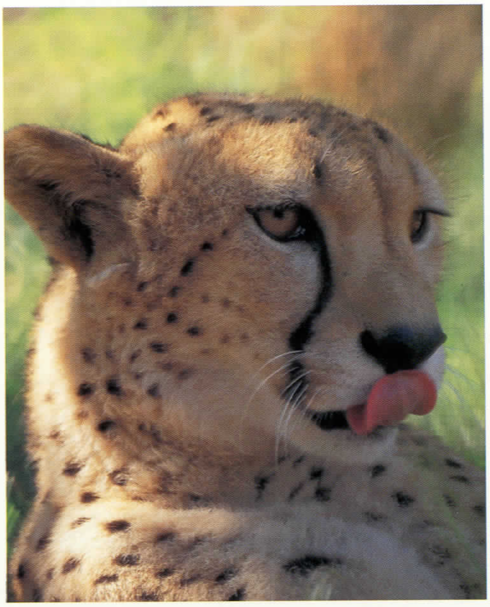
What if the rosy periwinkle had gone extinct like so many other species on Madagascar? What if it had never been discovered and named by a systematist? Knowledge of all species, no matter how small or insignificant they might seem, can unlock unimaginable potential and value in the diversity around us.

SA2000: CHARTING THE BIOSPHERE

AS PART OF THE INTERNATIONAL EFFORT TO CONSERVE BIODIVERSITY, search for new biological resources, and advance our knowledge about the world's species, the international systematics community proposes a program of discovery and understanding — an initiative entitled *Systematics Agenda 2000*. With the support of a concerned society, these scientists will seek answers to four fundamental questions:

1. What are the Earth's species?
2. What are their properties?
3. Where do they occur?
4. How are they related?

The information derived from this research will be organized into predictive classifications and databases for use by science and society.



THE INTERRELATED MISSIONS OF SA 2000

Meeting the challenges of the biodiversity crisis and successfully accomplishing the objectives of Systematics Agenda 2000 will require an intensive international effort involving three interrelated missions:

MISSION 1

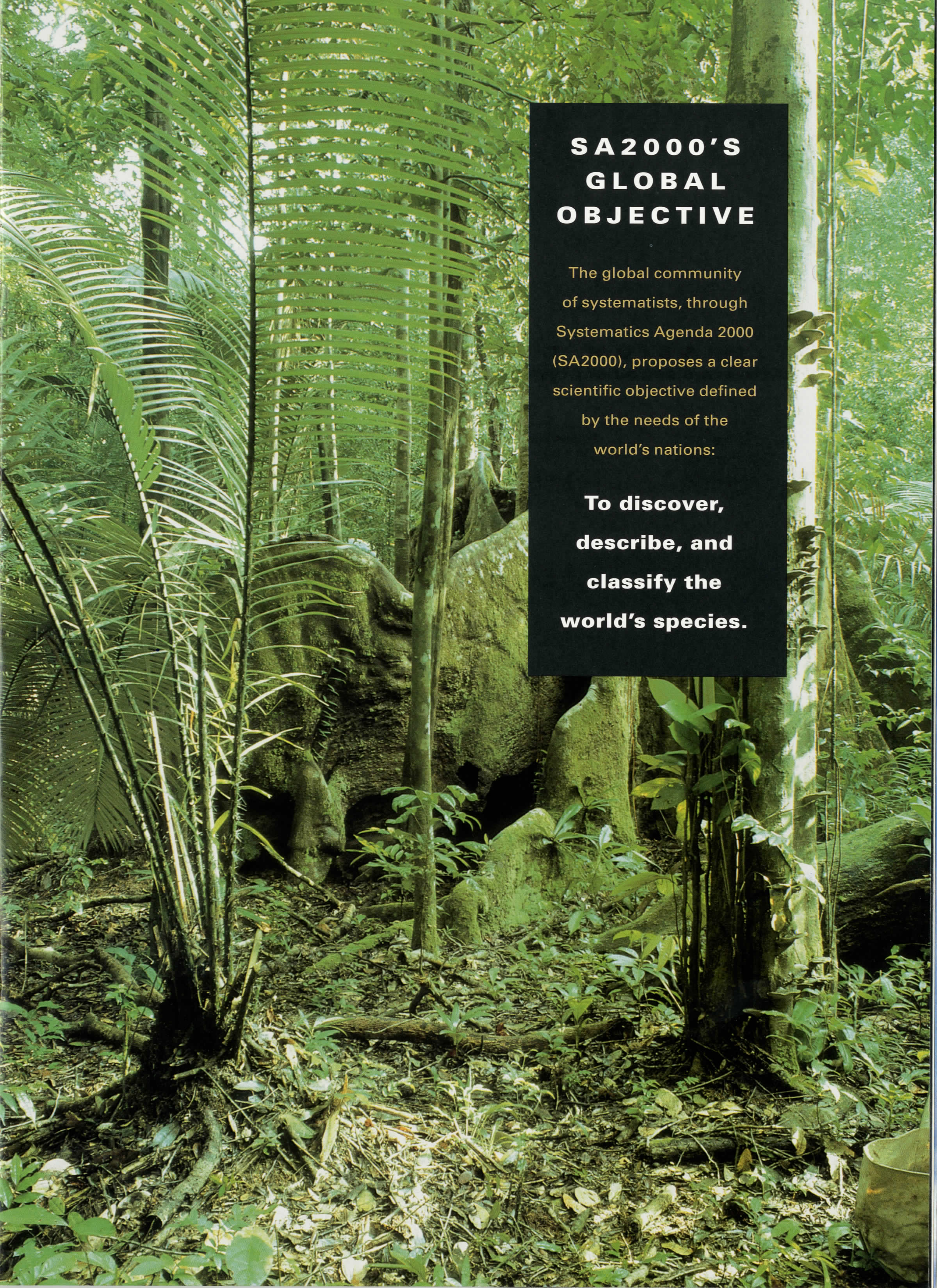
To discover, describe, and inventory global species diversity.

MISSION 2

To analyze and synthesize the information derived from this global discovery effort into a predictive classification system that reflects the history of life.

MISSION 3

To organize the information derived from this global program in an efficiently retrievable form that best meets the needs of science and society.



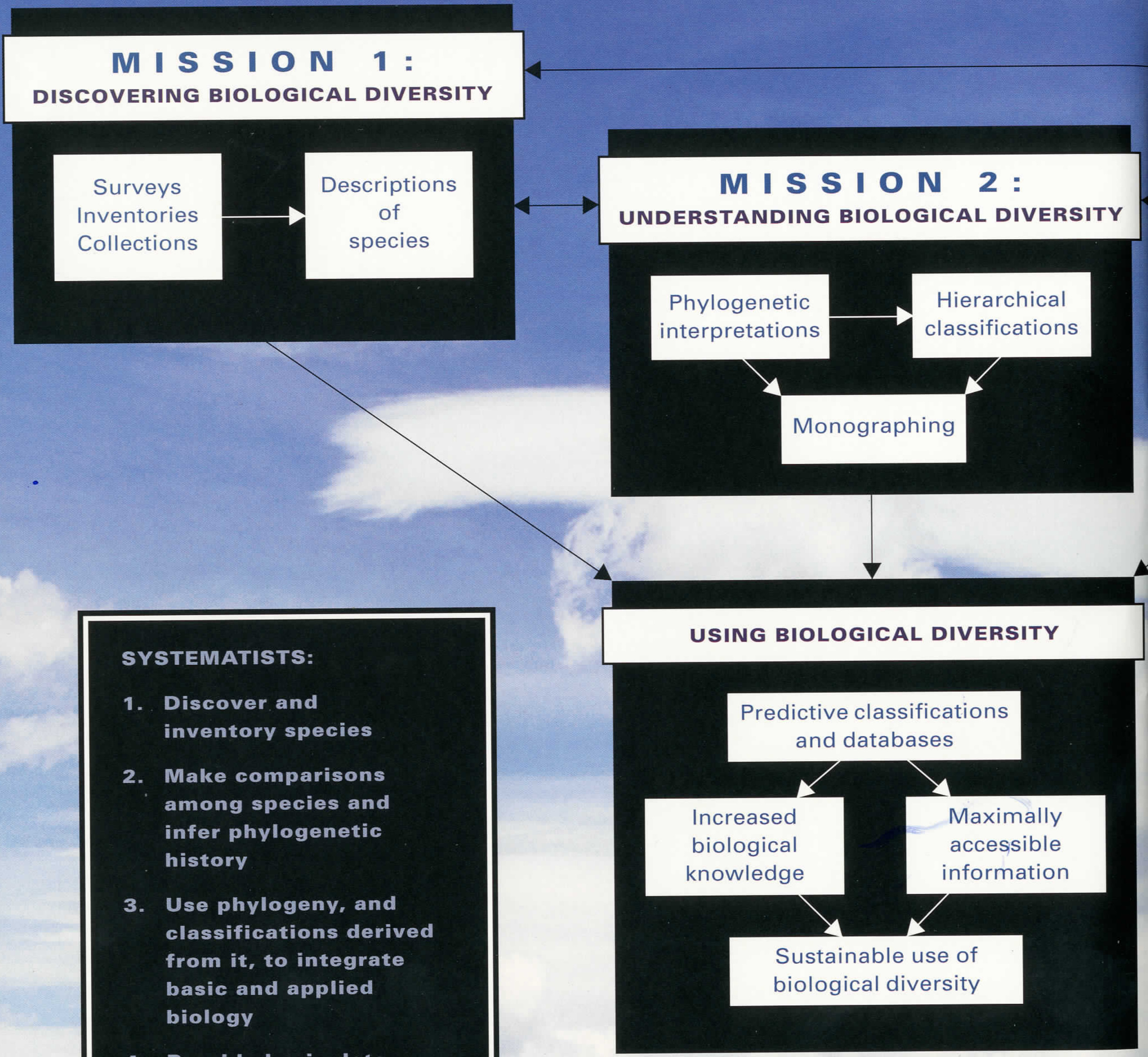
SA2000'S GLOBAL OBJECTIVE

The global community of systematists, through Systematics Agenda 2000 (SA2000), proposes a clear scientific objective defined by the needs of the world's nations:

To discover, describe, and classify the world's species.

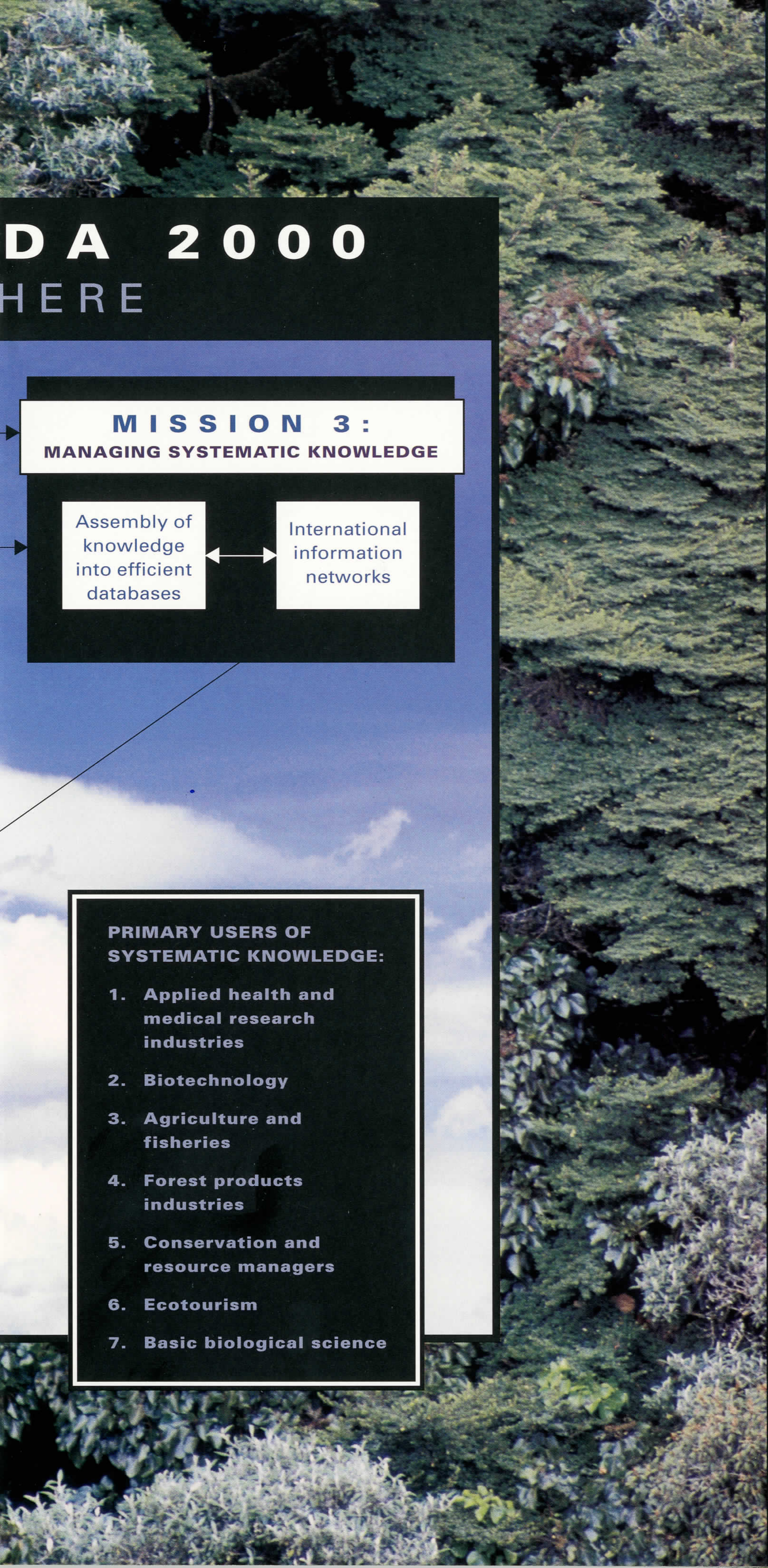
SYSTEMATICS AGEN

CHARTING THE BIOS



SYSTEMATISTS:

1. **Discover and inventory species**
2. **Make comparisons among species and infer phylogenetic history**
3. **Use phylogeny, and classifications derived from it, to integrate basic and applied biology**
4. **Provide basic data underlying sustainable use of biological diversity**



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MISSION 3:
MANAGING SYSTEMATIC KNOWLEDGE

Assembly of knowledge into efficient databases ⟷ International information networks

PRIMARY USERS OF SYSTEMATIC KNOWLEDGE:

1. Applied health and medical research industries
2. Biotechnology
3. Agriculture and fisheries
4. Forest products industries
5. Conservation and resource managers
6. Ecotourism
7. Basic biological science

"Many of the recommendations [to promote basic and applied conservation research] presume the existence of the taxonomic expertise to carry them out. Yet, the cadre of trained taxonomists necessary to perform this work simply does not exist. To describe, inventory, classify, monitor, and manage biodiversity, such expertise must be cultivated. It is the foundation on which the study and conservation of biological diversity are built."

U.S. NATIONAL RESEARCH COUNCIL
Conserving Biodiversity, 1992

MISSION 1

To discover, describe, and inventory global species diversity.

MANAGING THE BIOSPHERE responsibly will necessitate the discovery and identification of its basic components — the species in our planet's varied ecosystems. Despite considerable effort, the plants, animals, and microorganisms of all regions of the world remain largely unknown. In most ecosystems, in fact, the majority of species have not yet been collected, identified, or described.

This research mission will require an intensive exploration of our planet to collect and preserve representative samples, followed by a detailed analysis of the specimens discovered, in order to distinguish them from species already catalogued.

Several goals for this mission have been established:

1. To survey the major marine, terrestrial, and freshwater ecosystems to achieve a comprehensive knowledge of global species diversity.
2. To determine the geographic and temporal distributions of these species.
3. To discover, describe, and inventory species living in threatened and endangered ecosystems.
4. To target groups of species critical for maintaining the integrity and function of the world's ecosystems, for improving human health, and for increasing the world's food supply.
5. To target the least-known groups of organisms.

SYSTEMATIC DISCOVERIES IMPROVE THE WORLD'S FOOD SUPPLY

In the late 1970's, Rafael Guzman, a Mexican botanist exploring the cloud forests of Jalisco, discovered a wild form of corn. He sent seeds to systematists Hugh Iltis and John Doebley. The plants grown from those seeds belonged to an unknown species, named *Zea diploperennis*. This new species readily hybridizes with cultivated corn (*Zea mays*). Most importantly, *Z. diploperennis* is resistant to the seven main types of viral diseases that infect *Z. mays*. Thus, it may now be possible not only to produce perennial corn but also to transfer some of the viral resistance to domestic corn. Four commercial lines have already been produced that are virus resistant. Considering that the annual world-wide value of corn is nearly $60 billion, the potential economic benefits of this discovery are staggering.

WHAT ARE THE BENEFITS OF A GLOBAL SPECIES INVENTORY?

- **Species will be discovered and classified so that information about them can be summarized and incorporated into databases for efficient retrieval.**

- **Information will be generated on the diversity, distribution, and properties of species throughout the world.**

- **Baseline assessments of diversity will enable long-term monitoring and analysis of global change.**

- **New biological resources will be discovered, with tremendous potential to benefit humanity.**

MISSION 2

To analyze and synthesize the information derived from this global discovery effort into a predictive classification system that reflects the history of life.

SYSTEMATICS DOCUMENTS THE PROPERTIES OF SPECIES, integrates data from other fields of biology, and provides a conceptual framework for interpreting biological information.

Access to this knowledge — organized around a phylogenetic classification of life — will facilitate development of efficient information systems, thus enabling scientists to make predictions about species and their properties that are of scientific or societal interest. Such knowledge will also foster new interdisciplinary research.

Storing and retrieving information within the conceptual framework of a natural classification permits more efficient and economical use of our knowledge about species and their habitats. To accomplish these tasks, the systematic collection of organisms and the training of additional taxonomic expertise must be emphasized.

Several goals for this mission have been established:

1. To determine the phylogenetic relationships among the major groups of organisms, thus providing a conceptual framework for basic and applied biology.

2. To discover the phylogenetic relationships of groups of species that are critical for applied biology, targeting species that are important for human health and food productivity, as well as for conservation of the world's ecosystems.

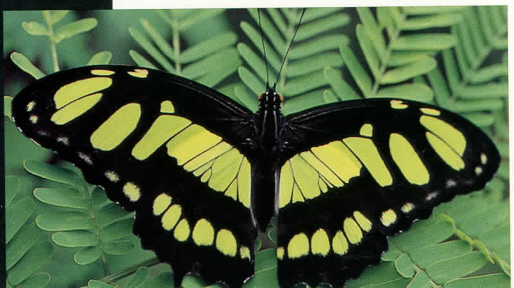
3. To discover the phylogenetic relationships of groups of species that are of crucial importance for the basic biological sciences, such as those having broad relevance for experimental science and those critical for maintaining the integrity and function of ecosystems.

4. To develop more powerful techniques and methods for systematic data analysis.

THE PREDICTIVE VALUE OF CLASSIFICATIONS

The Case of Taxol and Cancer

The natural product taxol — shown to be a powerful drug agent against ovarian and breast cancer — is derived from the bark of the Pacific Yew (*Taxus brevifolia*). Unfortunately, it takes the bark of three trees to provide sufficient taxol for a single cancer patient, and the trees are killed in the process. An understanding of the evolutionary relationships of the Pacific Yew led researchers to examine its close relatives, and it was discovered that a small quantity of leaves from the European Yew (*Taxus baccata*) can also be used to synthesize taxol, ultimately at less cost and with no harm to the European Yew itself.



WHAT ARE THE BENEFITS OF A PHYLOGENETIC CLASSIFICATION OF LIFE?

- It directs the search for genes, biological products, biocontrol agents, and potential crop species.
- It creates a predictive framework for the management of biological knowledge and a basis for communication across sciences.
- It assists in setting priorities for conservationists, policy makers, and resource managers.
- It provides a framework for measuring rates of extinction and patterns of global change.
- It provides the basis for comparative studies linking all fields of biology, as well as interdisciplinary studies encompassing all groups of organisms.
- It furnishes the scientific context for understanding processes of speciation, extinction, and adaptation that have produced the present diversity of life.

MISSION 3

To organize the information derived from this global program into an efficiently retrievable form that best meets the needs of science and society.

THE ACCUMULATION OF HUNDREDS OF MILLIONS OF FACTS about millions of species from around the world will demand innovative organization of this information to ensure efficient utilization and retrieval. The information will include systematic, geographical, and ecological data derived from current systematic collections, libraries, and archives. Knowledge will be continually updated as new species are discovered, phylogenetic relationships are clarified, and other information on species is accumulated. Electronic knowledge bases will be readily available on a global systematic information network, which will ensure access for the benefit of all nations. Databases — such as those for molecular genetics — will be linked with biotechnological databases through the use of standard species names and phylogenetic classifications.

Several goals for this mission have been established:

1. To develop systematic, biogeographic, and ecological databases of the world's species.

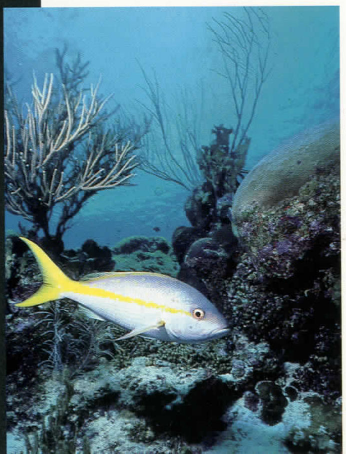
2. To develop linkages among databases for the efficient retrieval of all available information about species and the places they occur.

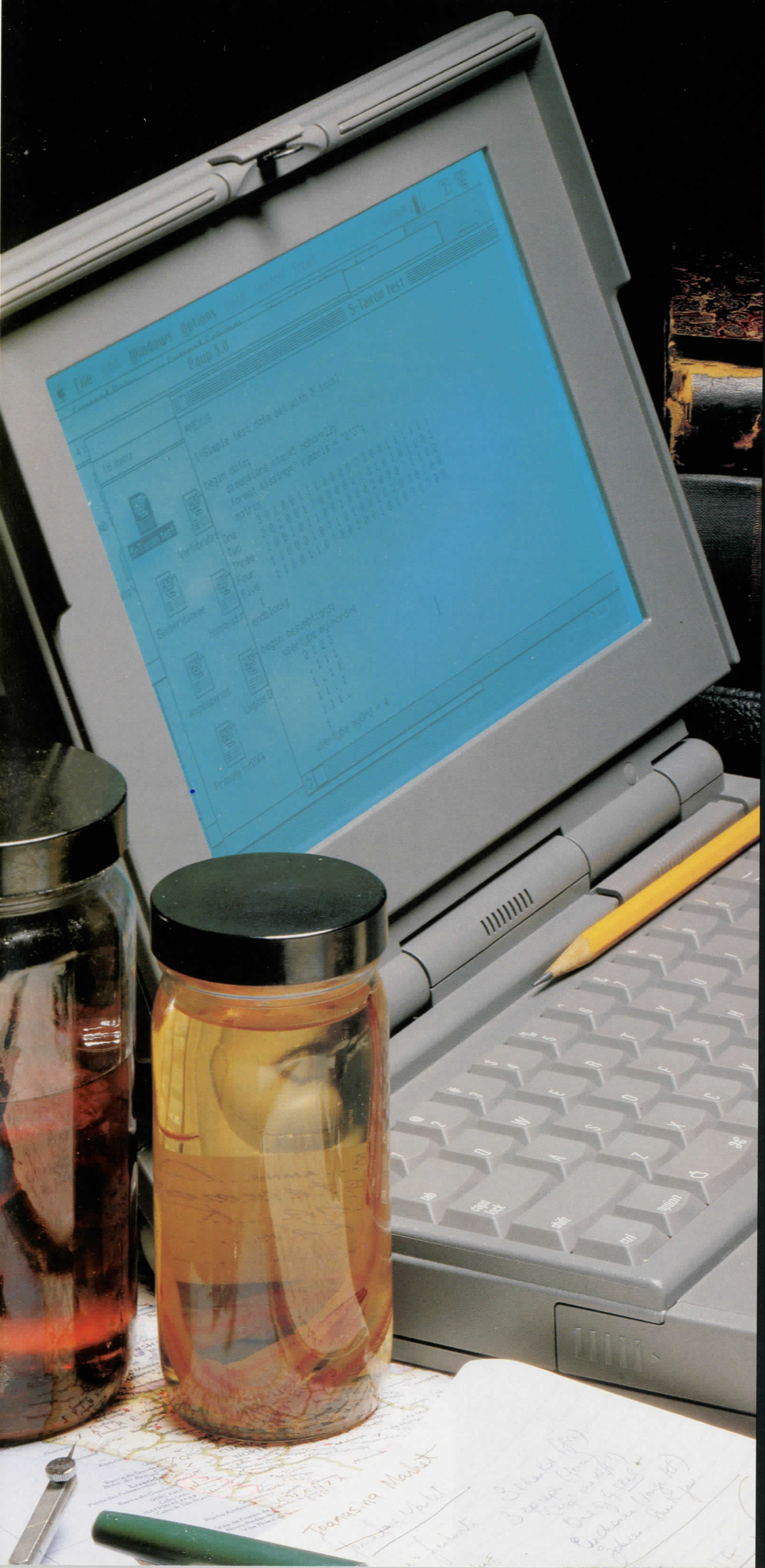
3. To develop and implement an information system that can be accessed efficiently by a broad international user community.

4. To develop mechanisms for maintaining and updating databases and information networks, including continuing hardware and software support.

". . . It is the fields of taxonomy and systematics that have suffered the most serious declines in the last years, resulting in an acute shortage of trained taxonomists, with almost none in the tropical countries. Also, there is a lack of specialists for many important groups of organisms, even in the developed countries. This is compounded by the fact that reference collections are few and unevenly located, very often far from the place of origin of organisms being studied. And current practices of taxonomy are often inefficient, with much duplication of effort. Hence, in launching any study on biological diversity, the question of removing the 'taxonomic impediment' must be addressed."

DIVERSITAS: IUBS-SCOPE-UNESCO Programme on Biodiversity





WHAT ARE THE BENEFITS OF AN EFFICIENT SYSTEMATIC INFORMATION SYSTEM?

- It provides ready access to systematic knowledge for problem solving.
- It allows policy makers to reach better-informed decisions and set priorities regarding sustainable resource use.
- It provides for better documentation of extinction rates and changes in the distribution of the Earth's species.
- It increases the cost-effectiveness of managing biological resources.
- It facilitates innovative comparisons and associations among data from biology and other sources.
- It enhances global communication and collaboration and reduces duplication of scientific effort.

MEETING THE CHALLENGE: A SYSTEMATICS ACTION PLAN

To ensure the success of *SA2000*, a systematics action plan with the following components has been developed:

1. To establish and enhance systematic research centers and their collections worldwide.
2. To support institutions committed to the education and training of professional systematists and support staff.
3. To develop and expand cooperative programs in research and education at systematic institutions worldwide.
4. To establish an electronic communications network that links these institutions to each other and to society at large.
5. To support comparative taxonomic research that is taxon-based and global in scope.
6. To expand the number of research positions in basic and applied systematics.

OVERCOMING OBSTACLES TO SYSTEMATIC RESEARCH

Currently, a number of critical obstacles exist that prevent the global systematics community from conducting the research necessary to understand and utilize biological diversity effectively. First, only about six percent of the world's scientists live in those countries that house 80 percent of the Earth's terrestrial diversity. To compound the problem, there are few, if any, taxonomic specialists in the world that are trained to work on many groups of organisms — including some of the most diverse and economically important. Finally, systematic research centers are rare in species-rich countries — and support for comparable research centers in other parts of the world is grossly inadequate.

These obstacles must be overcome by a coordinated action plan that substantially increases training in systematics and builds a collection-based infrastructure that includes museums, herbaria, and repositories for microorganisms and genetic resources.

"Scientific collections are a continuing investment by society in the effort to understand the natural world . . ."

PRESERVING NATURAL SCIENCE COLLECTIONS: CHRONICLE OF OUR ENVIRONMENTAL HERITAGE

ENHANCING SYSTEMATIC COLLECTIONS

A primary goal of this systematics action plan is to help each country establish the capability to survey and inventory its biological diversity. Although the organization of collection-based infrastructure will vary from country to country, the scientific core facilities must be systematic research centers staffed by professional systematists with taxon-based expertise. Many centers will build on pre-existing institutions and their collections; others will have to be newly created.

Each center will require systematic collections of organisms. Collections contain the primary evidence for the existence of species, document their presence at particular sites, and serve as the ultimate standards for comparisons and identifications of species. Collections cared for by trained systematists are required throughout the world to provide access to accurately identified specimens from local biotas — almost all of which will contain species found nowhere else.

Training new systematists from developing nations is another essential step toward achieving comprehensive knowledge of the world's diversity. Research and training positions must be established, and research funding provided — within these national centers and their cooperating institutions and agencies.

The recent development of national biological resource centers and initiatives around the world — such as the Comision Nacional para el Conocimiento y Usa de la Biodiversidad (CONABIO) in Mexico, the National Biological Survey in the United States, and the Instituto Nacional de Biodiversidad (INBio) in Costa Rica — provides an emerging context for enhanced systematic research, training, and collections. Institutions such as these play a critical role in preserving biological diversity by providing the basis for studying, managing, and conserving species in each country. They also serve as a focal point for efforts to enlist national support.

Another major component of this systematics action plan is the establishment of new systematic research centers worldwide. Existing centers must also be enhanced. Regional collections are rarely sufficiently comprehensive to facilitate broadly comparative systematic studies. Cooperative research and database linkages among institutions internationally are therefore essential. Such linkages are critical if the systematics community is to inventory and classify the world's species diversity efficiently and economically.

It is impractical and unnecessary to duplicate collections or taxonomic expertise for each group of organisms at every research center. Instead, systematists with global knowledge of particular taxa must be funded, through centers of international stature, to conduct research at many sites around the world — especially since species are often distributed across national boundaries. Systematic research is ultimately taxon-oriented, and thus comprehensive worldwide collections will be required for each group of organisms. To accomplish this goal, the full participation of institutions in all countries will be necessary.

HOW WILL THE WORLD BENEFIT FROM AN INTERNATIONAL NETWORK OF SYSTEMATIC RESEARCH CENTERS AND COLLECTIONS?

- **Teams of systematists and their support staff will be established in the taxonomic centers of each country. These teams will supervise local surveys, inventory species, and maintain collections.**

- **The network will provide all nations with a wide range of taxonomic expertise on all groups of species.**

- **Specimens, data, and knowledge will be available to science and society worldwide.**

- **The systematic research centers established in each country will serve as focal points for research, training, and local education about biological diversity.**

GLOBAL COOPERATION FOR GLOBAL GAIN

THE IMPERATIVE TO DESCRIBE AND UNDERSTAND THE EARTH'S SPECIES DIVERSITY has been recognized by the international community through numerous agencies and institutions, including:

- UN Conference on Environment and Development (UNCED) and AGENDA 21
- UN Environment Programme (UNEP)
- UN Development Programmme (UNDP)
- *Diversitas*, a consortium including:

  International Union of Biological Sciences (IUBS)

  Scientific Committee on Problems of the Environment (SCOPE)

  UN Education, Scientific and Cultural Organization (UNESCO)

  International Union of Microbiological Societies (IUMS)
- Microbial Diversity 21, an action plan of IUBS and IUMS

"We cannot even estimate the number of species of organisms on Earth to an order of magnitude, an appalling situation in terms of knowledge and our ability to affect the human prospect positively. There are clearly few areas of science about which so little is known, and none of such direct relevance to human beings."

PETER H. RAVEN
Global Biodiversity Strategy

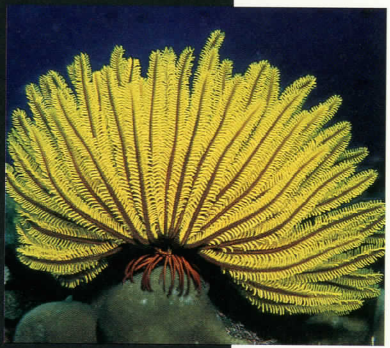
Similar calls have been made by nongovernmental organizations, in particular:

- World Resources Institute (WRI)
- World Wildlife Fund (WWF)
- World Conservation Union/International Union for the Conservation of Nature and Natural Resources (IUCN)
- The Nature Conservancy (TNC)

Systematics Agenda 2000 provides a global, taxon-based perspective on biological diversity and thus contributes to the scientific framework for conserving and managing this indispensable resource. *Systematics Agenda 2000* is thus complementary to all initiatives designed to learn about, conserve, and utilize biodiversity, including, for example, the Sustainable Biosphere Initiative (SBI) of the ecological community.

INVESTING IN SYSTEMATICS AGENDA 2000

Systematics Agenda 2000 IS AN AMBITIOUS PROGRAM that will require a significant level of support. No single government or international agency can be expected to fund this entire initiative. Rather, this funding must be obtained from the collective support of many institutions and governments worldwide. The missions of *SA2000* will encompass a 25-year program of intense effort at an investment of approximately US $3 billion per year.



Funding estimates are based on calculating the cost of developing human resources and computer networks, providing support for collections (including type culture and germplasm repositories), and undertaking and disseminating research findings to the world community. At current rates of funding, the missions outlined in the *SA2000* initiative will require minimally 150 years. Because of the urgency imposed by the accelerating loss of biodiversity, however, the current annual global level of research and infrastructural support (about US $ 0.5 billion) must be increased approximately six-fold to accomplish these missions during a 25-year period.

Considering the demonstrated scientific, economic, and aesthetic value of biological diversity, returns on this investment are assured. Humanity has already benefitted immeasurably from incremental progress in discovering, describing, understanding, and utilizing various species. Expanding this effort today will result in even greater benefits tomorrow — and will help preserve the Earth's magnificent diversity of life for generations to come.

"An enduring environmental ethic will aim to preserve not only the health and freedom of our species, but access to the world in which the human spirit was born."

E. O. WILSON
The Diversity of Life

SA2000 was initiated by three international systematics societies: the American Society of Plant Taxonomists, the Society of Systematic Biologists, and the Willi Hennig Society, in cooperation with the Association of Systematics Collections, and with financial support from the U.S. National Science Foundation. Initial documents were prepared by 27 Standing Committees composed of over 300 scientists representing a broad array of institutions and specializations. Drafts of this document have been reviewed by interested individuals, scientific societies, and national and international agencies and organizations.

THE COMMITTEES OF SYSTEMATICS AGENDA 2000

STEERING COMMITTEE

Co-chairpersons: Joel Cracraft, American Museum of Natural History, New York; Melinda Denton, University of Washington, Seattle; Hardy Eshbaugh, Miami University, Oxford; Michael Novacek, American Museum of Natural History, New York; Norman I. Platnick, American Museum of Natural History, New York.

Additional members: William R. Anderson, University of Michigan, Ann Arbor; Jonathan Coddington, National Museum of Natural History, Washington, D.C.; Rita Colwell, Maryland Biotechnology Institute, College Park; George Davis, Academy of Natural Sciences, Philadelphia; Michael Donoghue, Harvard University, Cambridge; William Fink, University of Michigan, Ann Arbor; Frank Gill, Academy of Natural Sciences, Philadelphia; David M. Hillis, University of Texas, Austin; Elaine Hoagland, Association of Systematics Collections, Washington, D.C.; Diana Lipscomb, George Washington University, Washington, D.C.; Douglas Miller, U.S.D.A. Systematic Entomology Laboratory, Beltsville; Brent Mishler, University of California, Berkeley; Peter Raven, Missouri Botanical Garden, St. Louis; Amy Rossman, U.S.D.A. Systematic Botany and Mycology Laboratory, Beltsville; Jay Savage, University of Miami, Miami; Beryl Simpson, University of Texas, Austin; Quentin Wheeler, Cornell University, Ithaca.

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Department of Ornithology

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