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THE INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAMME: A STUDY OF GLOBAL CHANGE (IGBP)
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CONTENTS

1	First START Meeting
4	Linking Land-use and Land-cover Changes
6	Regional IGBP Meetings
7	Terrestrial Ecosystem Studies Brought into Focus
9	The Global Climate Observing System
10	World Environment Day in Stockholm
11	Funding the IGBP
12	Personnel at the IGBP Secretariat
13	Publications
14	List of Meetings
15	Liaison Persons from ICSU Scientific Members

First START Committee Meeting

STOCKHOLM, SWEDEN, 24-26 APRIL 1991

The first meeting of the IGBP Standing Committee on the System for Analysis, Research and Training (START) was held in Stockholm, Sweden, on 24-26 April 1991, to discuss the development and implementation of START.

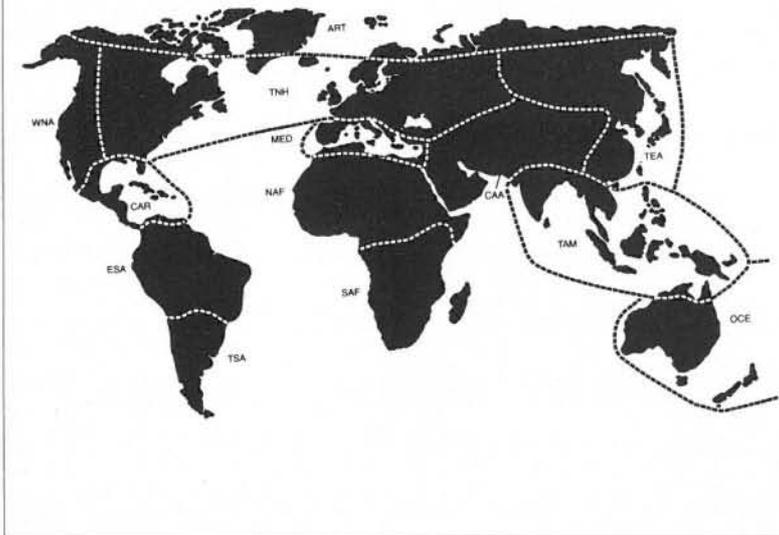
Plans for START, as presented in IGBP Report 15, envisage an international system of regional networks, research centres and sites to gather data and study global change problems in their regional contexts, with emphasis on the terrestrial environment. Particular attention during the meeting was devoted to the guiding principles for the recognition of Regional Research Networks (RRNs) and Regional Research Centres (RRCs). The meeting also reviewed the status of planned RRNs, and examined the means to develop strong and effective ties to the United Nations system.

The international science community has, through IGBP and the World Climate Research Programme (WCRP), developed a number of specific projects to address current uncertainties regarding the nature and consequences of global change. IGBP's START initiative will provide an important operational mechanism to ensure the success

of these projects and of relevant components of developing programme on Human Dimensions of Global Environmental Change (HDGEC).

During the remainder of 1991, the START Standing Committee intends to: establish a START office; stimulate and nurture the development of research centres and research networks in the priority regions previously identified (see map); institute mechanisms for their funding and management; and promote a START International Fellowships Programme. These tasks will be reported on at the International Conference on an Agenda of Science for Environment and Development into the 21st Century (ASCEND 21) to be held in Vienna 24-29 November 1991, as a preparatory step toward UNCED.

The Committee discussed principles for establishing regional research centres and regional research networks and will finalize these at its next meeting.



The 14 approximate geographic regions that were proposed in IGBP Report 15 as a possible global set of RRNs. Regions and boundaries that are adopted for the global START initiative will be based on regional needs and desires, through discussions with appropriate representatives from the nations involved.

ANT	Antarctic (not shown)	OCE	Oceania
AR	Arctic	SAF	Southern and Eastern Africa
CAA	Central Arid Asia	TAM	Tropical Asian Monsoon Region
CAR	Caribbean	TEA	Temperate East Asia
ESA	Equatorial South America	TNH	Temperate Northern Hemisphere
MED	Mediterranean	TSA	Temperate South America
NAF	Northern Africa	WNA	Western North America

Status of regional activities

Northern Africa

At the initiative of the French government, the planning for a Sahara and Sahel Observatory has been initiated. The goal of this programme is to bring new stimulus to the struggle against drought and land depletion by complementing and strengthening existing mechanisms in North Africa, East Africa and West Africa. The Sahara and Sahel Observatory would simultaneously carry out activities with respect to the "observation, research and prevention-correction facets". The programme should be conducive to establishing a "control panel" of the desertification process as well as to identifying and developing the preventive and remedial

actions called for. It is intended to promote relations between African scientists and the major international scientific environmental programmes, especially the IGBP.

An African Centre of Meteorological Applications for Development (AC-MAD) has been founded in Niamey, Niger. This centre, which is being established by the Economic Commission for Africa and the World Meteorological Organization (WMO), will analyze and forecast the weather and the climate forces that affect the 50 countries of the region. At the same time, the centre will enable the developed countries of the world to improve the quality of their own predictions through the utilization of better information from Africa. As climate change will profoundly affect African countries, the effects of climate change in Africa, es-

pecially those related to drought, must be monitored and predicted so that nations can take the appropriate adaptive and protective measures. A Regional Agrometeorological-Hydrological Centre (AGHRYMET) supported by the Food and Agricultural Organization (FAO) and the WMO, is also located in Niamey, Niger, as well as a regional centre for the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

Tropical Asian Monsoon Region

The START Standing Committee reviewed the recommendations from the IGBP Regional Workshop held in New Delhi in February 1991. It especially noted the expressed interests of the IGBP Committees in India and China (Chinese Association for Science and Technology, Beijing, and the Academia Sinica in Taipei) that they wished to be considered for hosting RRCs. The START Committee further noted the recommendation from the Asian meeting that the Indonesian region should receive priority consideration.

IGBP plans to arrange a regional meeting for South-East Asia in the latter part of 1992 and the question of the establishment of a Regional Research Network with a Regional Research Centre should be addressed at that time. The IGBP Executive Director will visit the region in July 1991 to discuss this further. The Chairman of the Indian National Committee is preparing a meeting for Asian National Committees in December, 1991, in Singapore, at which time this could be further discussed.

Central Arid Asia

The USSR National IGBP Committee has suggested the establishment of an RRC affiliated to the Institute of Desert Research, Academy of Sciences of Turkomania, Ashkhabad. There is a need to identify the Regional Research Sites that could form part of a network for the region. There are indications that the Desert Institute of the Chinese Academy of Sciences would be interested in such collaboration. Contacts should also be established with the Arabic Centre for the Studies of Arid Regions and Highlands located in Damascus, Syria.

Temperate East Asia

China (CAST) has proposed to establish an RRC for Temperate East Asia in

China. Such an RRC should be developed in parallel to an RRN for the region with strong participation of countries outside of China.

Antarctic

The New Zealand National IGBP Committee has proposed the Antarctic research centre in Christchurch for the establishment of an RRC. The START SC will consult with the Antarctic science community through the Scientific Committee for Antarctic Research (SCAR) on this issue.

Arctic

An International Arctic Science Committee (IASC) has been established and has decided that global change research will be one of its initial priorities. The network of collaboration that will develop within this body may form an initial component of an RRN for the region.

The Western Hemisphere

At the White House Conference on Science and Economic Research related to Global Change held in April 1990, the US proposed the establishment of several regional institutes for global change research, one of which would be located in the western hemisphere. The overall purpose of these institutes is similar to that of START RRCs and the IGBP is seeking close cooperation in the development of these two initiatives.

The USA will host a workshop during 15-19 July, 1991 in Puerto Rico on the development of a Western Hemisphere Regional Institute for Global Change Research. Representatives of governments of the nations in the western hemisphere and a number of observers have been invited to attend.

It is expected that this workshop will: (1) develop a scientific agenda for such an institute; (2) develop an organizational plan; (3) develop specific criteria for determining the institute's location; and (4) determine the level of interest of the participants in contributing resources to this effort. Recommendations on the above issues could then be distributed to participating governments with a follow-up meeting of senior governmental representatives later in 1991, to consider the resources appropriate to such an institute. If the research agenda is based on international plans for global change research (IGBP, WCRP, HDGEC), the insti-

tute could become an RRC of START.

Temperate Northern Hemisphere

The Irish National IGBP Committee has proposed to establish an RRC in Galway. Canada convened a meeting in May 1991 to discuss Canadian interests in START, part of this region will be also included in the discussions on the Western Hemisphere initiative.

The START Standing Committee will also consult with the International Institute for Applied Systems Analysis (IIASA) in relation to East-West collaboration in the area of global change relevant to the Temperate Northern Hemisphere region. It will also continue the discussions with the Centre for Earth and Environmental Sciences that is being set up in Trieste, Italy. Such a centre may play an important role in promoting training of scientists from developing countries in areas such as General Circulation Modelling.

Mediterranean

France has proposed to establish in Toulouse (France) an RRC for the arid, semi-arid and desertification-threatened regions. The United Nations Environment Programme (UNEP) also has a Regional Seas Programme for the Mediterranean, with a secretariat in Athens. These initiatives may be the basis for establishing a network in the region.

Oceania

A session on IGBP was held at the recent meeting of the Pacific Science Conference (Hawaii, USA June 1991), providing the opportunity for discussion of a possible RRN for Oceania.

Treatment of the Open Oceans

The IGBP Scientific Committee has requested the Joint Global Ocean Flux Study (JGOFS) and the International Global Atmospheric Chemistry Project (IGAC), in consultation with the Committee on Climatic Changes and the Ocean (CCCCO), to comment on the report from the Bellagio meeting and give their views on what, if any, institutional structures will be needed to facilitate regional observations of oceanic areas.

The START Standing Committee also reviewed the proposal received from the Bermuda Biological Station and decided to ask JGOFS and IGAC to consider this proposal in their evalu-

ation of the needs for an RRN for oceanic areas.

Relationship to the United Nations

In developing the START initiative, it is important that appropriate links to relevant parts of the UN system are maintained and strengthened. The START Standing Committee and Secretariat will discuss the Regional Research Centres and Networks with UNEP, Unesco, WMO and FAO. The Scientific and Technical Advisory Panel of the Global Environmental Facility (GEF) (under the auspices of UNEP, the United Nations Development Programme and the World Bank) has expressed interest in the START initiative and will consider possible recommendations for GEF involvement in further developments of the START concept.

The UNEP Governing Council made a decision on START at its meeting in Nairobi in May (see box).

It is important that the concept of START be included in the discussions at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro 1-12 June 1992. National IGBP Committees have been urged to contact their national preparatory committees for UNCED.

The International Council of Scientific Unions (ICSU) is arranging an International Conference on an Agenda of Science for Environment and Development into the 21st Century (ASCEND 21) to be held in Vienna 24-29 November 1991 in response to the request for ICSU to act as the principal scientific advisor to the conference from the Secretariat of UNCED. The Scientific Committee of IGBP has proposed the following three items for consideration by the conference: (i) the need for scientific research to develop a predictive understanding of the Earth system (IGBP and WCRP), (ii) the need for START, and (iii) the necessity for collaborative activities between IGBP and the Human Dimensions of Global Environmental Change programme, as exemplified by the planning for joint activities in relation to land use/land cover change ■

DECISION ON START MADE BY THE UNITED NATIONS
ENVIRONMENT PROGRAMME GOVERNING COUNCIL AT ITS SIXTEENTH SESSION
IN NAIROBI IN MAY 1991 (UNEP/GC.16/L.18):

12. Regional activities within the International Geosphere-Biosphere Programme related to changes in the global life-supporting system

The Governing Council,

Concerned by the changes in the global life-supporting system as a result of human activity,

Considering that the understanding of the changes is a necessary step towards mitigating or adapting to them,

Cognizant that proper monitoring of global change is an indispensable element of an environmentally sound strategy for sustainable development,

Considering that the International Geosphere-Biosphere Programme and the World Climate Programme play an essential role in improving the understanding of the causes and consequences of global change, including global climate change,

Noting General Assembly Resolution 44/207 of 22 December 1989, by which the Assembly recommended that Governments continue and, wherever possible, increase their activities in support of the World Climate Programme and the International Geosphere-Biosphere Programme and that the international community support efforts by developing countries to participate in these scientific activities,

Noting further the final statement of the Scientific and Technical sessions of the Second World Climate Conference, which, inter alia, called for a special initiative that would create a network of regional interdisciplinary research centres, located primarily in developing countries, and focusing on all the natural science, social science, and engineering disciplines required to fully support integrated studies of global change and its impacts and policy responses (A/45/696/Add.1, annex II, section C, para. 11),

1. *Welcomes* the initiative of the International Geosphere-Biosphere Programme to address regional problems of global importance through its Global Change System for Analysis, Research and Training (START);

2. *Appeals* to all member nations to establish and support national committees for the International Geosphere-Biosphere Programme;

3. *States* that the START activities of the International Geosphere-Biosphere Programme in the developing regions deserve the support of the governments from within and outside the region concerned;

4. *Requests* the Executive Director to provide support to the International Geosphere-Biosphere Programme regional research centres and networks, which should be planned and implemented in conjunction with the relevant World Climate Programme activities.

Linking Land-use and Land-cover Changes

JOINT APPROACH BY IGBP
AND THE INTERNATIONAL SOCIAL SCIENCE COUNCIL

The International Social Science Council (ISSC) and the International Geosphere-Biosphere Programme have joined to examine the need for further research on the causes of global land-use and land-cover change. An agreement of cooperation addressing global

change research needs related to land-use/cover was made between the IGBP and the ISSC, following a recommendation from the 2nd Scientific Advisory Council of IGBP, held in Paris, September 1990.

The two bodies have agreed to de-

velop a study on the relationship between land use (relating to the interests of the ISSC) and land cover (relating to the interests of the IGBP), with the overall aim of predicating the physical consequences of social changes with respect to land management.

An ad hoc working group has been appointed to define the initial research components around one or more land-use/cover issues. The working group includes four members selected by the SC-IGBP and four members by the ISSC. The first meeting was hosted by the ISSC in New York, 25-26 April 1991.

The discussions at the ISSC-IGBP meeting focussed on the need for two parallel studies of the human causes of global land-use and -cover change. One will consist of worldwide case studies, the other of a global synthesis; both aim at providing better insights into the modelling of changes in land use and cover. The case studies would seek to understand the regional complexities of the cause-impact interaction, and determine the applicability of regional sets in which common causes lead to common impacts. The synthesis study provides the base from which the case studies can be compared.

The ISSC-IGBP working group will use the 1991 summer session of the Global Change Institute at Snowmass, Colorado (arranged by the Office of Interdisciplinary Earth Studies) as a spring-board for its incipient ideas and as a mechanism to enhance understanding about the subject. The theme

of this year's two-week institute is "Global Land-Use/Cover Change."

The second meeting of the working group (Stockholm, 27-29 September 1991) will finalize a report with a proposed plan of action. This report will be presented to the ICSU International Conference on an Agenda of Science for Environment and Development into the 21st Century (ASCEND 21) in Vienna, November 1991, in preparation for the United Nations Conference on Environment and Development, Rio de Janeiro, 1-12 June, 1992.

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Regional IGBP Meetings

Follow-up to the Asian IGBP Workshop

As an outcome of the IGBP Regional Workshop for Asia held in New Delhi during 11-15 February 1991, a number of follow-up activities have emerged or are being planned. These include training and fellowships for young scientists, and a further meeting to implement the Workshop recommendations. Workshop recommendations have been published as IGBP Report No. 18:1 (1991).

New Fellowship Programme

Recognizing the need for regional cooperation and the promotion of advanced research in IGBP-related studies in developing countries, the ICSU Committee on Science and Technology in Developing Countries (COSTED), jointly with the Council of Scientific and Industrial Research (CSIR) of the Government of India, has initiated a training programme for scientists from Asian developing countries other than India. Short-term intensive training will be offered in well defined scientific areas of IGBP relevance to the Asian region, and particularly the sending country. The training opportunity will be provided in some of the CSIR laboratories in India that already have a number of ongoing IGBP related programmes.

Ten fellowships will be awarded for scientists from any developing country to participate in the programme. In addition to subsidized accommodation, the award holder will also be provided with a monthly stipend on par with the Junior Research Fellowship of CSIR for the first two years, and with the Senior Research Fellowship for subsequent years. The travel expenses for the trainees will be borne jointly by COSTED and the sending country. Minimum qualification requirements

are a Masters degree in science or its equivalent. The candidate should hold a research assignment in a University or a Laboratory. The award holder may register for Ph.D. degree either in India or in his/her home country, and submit a thesis of the work done in the CSIR Laboratory.

Nominations of suitable candidates are to be submitted any time during the year by Vice Chancellors of Universities, Heads of Scientific Institutions, Academies of Science or similar organizations. Nominations may be sent to: Mr. K. N. Johry, Adviser & Head, ISC, CSIR, Rafi Marg, New Delhi 110001, with a copy to: Prof. R. R. Daniel, Scientific Secretary, COSTED, 24 Gandhi Mandap Road, Madras 600 025, India.

Asian Implementation Meeting

In order to implement the recommendations from the Asian IGBP Workshop on future plans, programmes, collaboration ventures and regional and international cooperation, an Asian meeting of representatives from governments, scientific academies and organizations is planned in Singapore in December 1991.

Participation at this meeting will be restricted to about two representatives from each of the developing Asian countries, including those who can exert influence on decision making in their home country. This meeting is intended to facilitate the further development of high priority regional cooperation in global change studies.

IGBP Workshop at the XVII Pacific Science Congress

A Resolution for the Pacific Science Association Council was made at the Workshop, held on 28 May 1991. The Workshop was convened by B. G.

Thom, Chair of the Australian IGBP National Committee:

Recognizing that the Pacific Science Association and the Pacific Science Congress offer a forum to explore issues, define problems and continue to search for solutions to the challenges facing the world, particularly the Pacific Region, in the next century, and

Recognizing that the International Geosphere Biosphere Programme (IGBP), the World Climate Research Programme (WCRP), and the programmes studying Human Dimensions of Global Environmental Change (HDGEC) are complementary long-term programmes of research, necessitating international cooperation, and which are aimed at the description and understanding of physical, biological and socio-economic phenomena that regulate and modify the total Earth system,

The Workshop on the IGBP at the XVII Pacific Science Congress resolved:

1. That the Pacific Science Association establish a multidisciplinary Task Force to monitor and explore developments in research in global environmental change relevant to nations of the Pacific region;
2. That this Task Force be given the opportunity of organizing an inter-congress workshop on global change issues involving scientists, decision-makers and various international agencies involved in the Pacific region;
3. That at future Pacific Science Congresses there be further opportunity for reports and debates on matters arising from research of the IGBP, WCRP, HDGEC and other such groups working on global change problems with particular emphasis on phenomena which impact on populations of the region which are vulnerable to change;
4. That the Pacific Science Association make use of its various publishing units to report on activities of global change research relevant to the Pacific region ■

Terrestrial Ecosystem Studies Brought into Focus

BRIGHTON, UK, 18-21 FEBRUARY 1991

Open Meeting Global Change and Terrestrial Ecosystems (GCTE)



The development of the GCTE Core Project of IGBP took an important step forward recently with the success of its Open Meeting. It was attended by ninety-two scientists representing twenty-three countries. The purpose of the Open Meeting was to allow interested scientists from around the world to contribute to, comment on, criticize, and suggest changes to the proposed GCTE research programme. As a result, the draft GCTE implementation plan, which is based on the scientific issues outlined in Chapter 6 of IGBP Report No. 12, was considerably refined and strengthened. The project is divided into three main foci, with further division into activities and tasks; a review of their current status follows.

Focus 1, on ecosystem physiology, largely retained its previous structure with a change in emphasis of Activity 3

(water and energy fluxes) and a sharper definition of its relationship to the Biospheric Aspects of the Hydrological Cycle (BAHC) Core Project of the IGBP.

Within Focus 2, on change in ecosystem structure, there was a rearrangement of tasks between Activities 2 and 3. Activity 2 now concentrates on problems of scaling from patch to landscape to region in the development of models of ecosystem structural change. Activity 3 concentrates on monitoring and predicting land cover changes at a global scale and on linkages with global change models.

Prior to the Open Meeting, Focus 3, on global change impact on agriculture and forestry, was the least well-developed of the three Foci. However, during the meeting its objectives and research questions were considerably re-

fined and sharpened. In particular, major changes were made to Activities 1 and 3, thus:

- Activity 1, on effects of climate and atmospheric change on key agronomic species, now emphasizes the effects of elevated CO₂ concentration on the yields of major crop and forest species and of pastures, and the interaction of these effects with climate change.

The response of multi-species production systems to elevated CO₂ concentration and climate change will also be studied.

- Activity 3, on change in *in situ* properties, redistribution, and net loss of soil, now concentrates on changes to soil processes and properties resulting from changes in climate, vegetation, and land use. The effects of these changes in soil processes and properties on groundwater flow and runoff and on

GCTE FOCUS 1: CHANGE IN ECOSYSTEM PHYSIOLOGY

Activity 1	Effects of elevated CO ₂ concentration
Task 1	Plant response to elevated CO ₂ concentration
Task 2	Ecosystem response to elevated CO ₂ concentration
Activity 2	Changes in the biogeochemistry of carbon, nitrogen and other elements
Task 1	Critical region studies
Task 2	Sources and sinks of carbon in terrestrial ecosystems
Activity 3	The interaction of water, energy and elemental fluxes in terrestrial ecosystems
Task 1	Water availability and biogeochemical cycles
Task 2	Water use efficiency

(Focus 1 meeting was held in Asilomar, California, USA, 7-10 May 1991)

soil degradation, as well as the feedbacks to climate and atmospheric change, will also be investigated.

A recommendation of the meeting was the incorporation of Global Change and Ecological Complexity (GCEC) as a future Focus 4 within GCTE. It was argued that the ecological complexity issue, very closely related to the biodiversity issue, follows closely from the

work of Activity 2, of Focus 2 on change in ecosystem structure, and should therefore be part of GCTE. The GCEC is currently regarded as a potential IGBP Core Project, and this will be further considered by the Scientific Committee for the IGBP in consultation with the Scientific Committee on Problems of the Environment and the International Union of Biological Sciences.

Two other recommendations arose from the GCTE Open Meeting. The first is that GCTE emphasized the need for interactions amongst the three Foci (to ensure an effective synthesis of GCTE activities) and between GCTE and other Core Projects. The second recommendation is that the importance of land-use change vis-à-vis climate change should be emphasized more

GCTE FOCUS 2: CHANGE IN ECOSYSTEM STRUCTURE

Activity 1	Changes in biological composition of species functional types and ecosystem structure at the patch scale
Task 1	Classification of functional types
Task 2	Characterization of functional type responses to key climatic variables and CO ₂
Task 3	Linkages between community dynamics and ecosystem processes
Task 4	Climate-induced changes by fire (in particular) and other disturbance regimes that affect community composition and ecosystem physiology
Activity 2	Ecosystem dynamics at the landscape level
Task 1	Development of a generic model of landscape dynamics
Task 2	Monitoring and observation
Activity 3	Change in the distribution of biota and regional and continental land cover and land use
Task 1	Develop a functional classification system of global vegetation types
Task 2	Predicting changes in functional type distributions at the regional or continental scale
Task 3	Testing models against historical data
(Focus 2 meeting was held in Trondheim, Norway, 10-14 June 1991. This meeting was made possible by generous financial support from the Norwegian Government)	

GCTE FOCUS 3: GLOBAL CHANGE IMPACT ON AGRICULTURE AND FORESTRY

Activity 1	Effects on climate and atmospheric change on key agronomic species
Task 1	Effects of climate change on crops and woody species
Task 2	Effects of elevated CO ₂ concentration on major crops and forest species in terms of harvested products
Task 3	Effects of climate change and elevated CO ₂ concentration on pastures
Task 4	Response of multi-species production systems to climate change and elevated CO ₂ concentrations
Task 5	Geographical distribution of agricultural species and production systems
Activity 2	Changes in pests and diseases of crops and livestock
Task 1	Dynamics of pests in relation to climatic gradients
Task 2	Predictive models for selected pests of key crops and animals
Activity 3	Change in situ properties, redistribution, and net loss of soil
Task 1	Changes in soil processes resulting from changes in climate, vegetation and land use
Task 2	Climate-induced changes in soil properties resulting in changes to ground water and run-off
Task 3	Effects of changes in climate on processes of soil degradation
Task 4	Effect of soil processes on climate and atmospheric change
Task 5	Development of databases for use in other Foci
(Focus 3 meeting will be held in Wageningen, the Netherlands, 9-13 September 1991)	

strongly in the GCTE research programme. Land-use change is particularly important in many tropical regions, where the effects of forest clearance will, in the short term, far outweigh any effects due to changes in climate and atmospheric composition.

The next stage in the development of the GCTE implementation plan is a series of Focus meetings to be held

during 1991. These meetings will build on the draft implementation plan, as modified at the Open Meeting, to produce a definitive research agenda for each of the three Foci. The GCTE implementation plan, which will result from this series of meetings, will be published in late 1991 and widely distributed.

For more information on the GCTE Open Meeting, or a copy of the Meeting Report, please contact : Dr. Will Steffen, GCTE Core Project Office, PO Box 84, Lynham ACT 2602, Australia, Tel: (+61-6) 242 1755; Fax: (+61-6) 241 2362 ■

The Global Climate Observing System

WINCHESTER, UK, 14-15 JANUARY 1991

Documenting global change, one of the underlying IGBP themes to be embodied in all of the programme's core projects, will require substantial new commitments from governmental and intergovernmental bodies. Scientists interested in time series observations for many of the properties of the Earth system, which are either likely or certain to be changing at significant rates on a decade to century time scale, know how difficult it is to maintain such efforts without firm institutional commitments. The extraordinary perseverance of a few scientists lies behind some of the key time series that today provide the most convincing evidence for global change.

The realization that certain aspects of global scale change in the composition of the atmosphere that are brought about by industrial development and changing land-use practices have the potential to alter climate, has attracted the attention of government leaders around the world. Through the joint efforts of the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), the Intergovernmental Panel on Climate Change (IPCC) undertook a comprehensive assessment of the evidence for climate change, the likely course for future change, and possible consequences of such change.

The widely accepted prediction that increasing concentrations of "greenhouse gases" will alter Earth's radiation budget sufficiently to cause global changes in climate has led to increased interest in establishing a coordinated

and long-term effort to observe changes in climate. From discussions on this topic at the Second World Climate Conference came the recommendation that a Global Climate Observing System (GCOS) be established. In their research to understand and predict global change, both the World Climate Research Programme (WCRP) and the IGBP would benefit from increased governmental commitments to document changes in physical and biogeochemical aspects of the global climate system.

An ad hoc meeting to explore this concept further was convened in Winchester, United Kingdom, from 14-15 January 1991, with the sponsorship of the WMO, the Intergovernmental Oceanographic Commission of Unesco and the International Council of Scientific Unions. IGBP and ICSU interests were represented by Prof. Thomas

Rosswall (Executive Director, IGBP) and Dr. John Woods (member of ICSU Advisory Committee on the Environment).

The goals of GCOS were defined as follows:

- Climate system monitoring, climate change detection and response monitoring, especially in terrestrial ecosystems
- Data for application to national economic development
- Data for research towards improved understanding, modelling and prediction of the climate system
- Eventually, a comprehensive observing system for climate forecasting.

Present observing systems for monitoring the atmosphere, land surface and oceans could not meet these goals. For the atmosphere the World Weather Watch (WWW) provides a basic system

for operational purposes, but the geographical coverage is poor from a climatological perspective. Furthermore, present monitoring and understanding of greenhouse gas cycles remain inadequate for predicting their future concentrations in the atmosphere. For the land surface and the oceans, observations are available from a variety of

established sources, but none of these currently provides both the global coverage and the continuity on decadal time-scales that are required for climate research and prediction.

The Winchester meeting concluded that there was need is for a Global Climate Observing System which would provide:

- Comprehensive information on a wide range of atmospheric, land surface, coastal and deep ocean properties
- Global coverage
- Continuity of observations on decadal time-scales
- Improved accuracy and resolution, as needed to characterize the thermody-

World Environment Day in Stockholm

The United Nations Environment Programme presents "Global 500" awards on the occasion of World Environment Day, June 5. This year, to commemorate the first United Nations Conference on the Environment, Stockholm 1972, the ceremony was held in Sweden's capital. Forty-nine awards were made, distributed between 27 nations, to honour those who have contributed to environmental awareness and protection.

The 1991 laureates included many well-known names, such as Geoffrey Palmer (former Prime Minister of New Zealand), Jonathan Poritt (of Friends of the Earth), and Sir Crispin Tickell (former British Ambassador at the UN). We congratulate particu-

larly Malin Falkenmark, who is IGBP Liaison for the International Association of Hydrological Sciences. In addition, awards were given to companies, organizations and communities that had shown particular dedication to sustainable development, and to the "unsung heroes" working at the front line of global environmental action – including foresters from Costa Rica and Burkina Faso, educators from Argentina, India and Mexico, a farmer from Zimbabwe, a journalist from Mongolia, and a town planner from Korea.

The Executive Director of UNEP, Dr. Mostafa K. Tolba, and the President of Brazil, Mr. Fernando Collor de Mello, came to Stockholm to participate in the award ceremonies. During their stay they also visited the Royal Swedish Academy of Sciences and met with the Executive Director of the IGBP, among other members of the scientific community.



Dr. Mostafa K. Tolba, Executive Director of UNEP, at the Royal Swedish Academy of Sciences on 4 June 1991 signs the IGBP visitors book where he wishes the programme success in its research work.



The Brazilian President visits the Royal Swedish Academy of Sciences on 4 June 1991. From left to right: Prof. Carl-Olof Jacobson, Secretary General of the Academy, H.E. Fernando Collor de Mello, President of Brazil, Professor Torvard Laurent, President of the Academy.

dynamic, dynamic, geophysical and biogeochemical processes of the climate system

- Systematic data acquisition and international data exchange.

The long-term benefits to nations of both the GCOS, and the global climate forecasting systems that will use its data, were expected to match those currently derived from the WWW and its accompanying meteorological forecasts.

In spite of the magnitude of the task, it was considered to be achievable. The prime requirements to move from the present state to an effective GCOS were identified:

- The improvement of specific components of the WWW and the development of some additional atmospheric observing networks

- The establishment of the Global Ocean Observing System (GOOS)

- The continuation of national and international science programmes, such as the World Climate Research Programme (WCRP) and the International Geosphere-Biosphere Programme (IGBP), and from that base, the development of a global land-surface observing system

- The maintenance and further development of a comprehensive satellite programme in which emphasis is placed on both increased accuracy and continuity of observation, for oceanic and continental, as well as atmospheric, properties

- The development of new observing technologies in specific areas.

Much of this could be achieved by building on proven techniques used in existing and planned programmes; the emphasis in GCOS would be on a wider, more systematic deployment sustained over decades. Co-ordination of the plans and an assessment of the overall status of implementation were essential if the GCOS is to be established quickly, and in a cost-effective manner. It would not be sufficient to rely on opportunistic improvements; the investment in GCOS development should focus on achieving a balance between the observational resources deployed, and the relative importance of those observations to the understanding and prediction of the climate system and climate change detection and response monitoring.

To help achieve this, the Winchester meeting recommended that a Steering Committee and a Planning Office

be formed, to report to the participating organizations and agencies, with the task of:

- Identifying the science and operation requirements to meet the objectives

Identifying the necessary improvements to existing systems and highlighting those areas where special international effort is required

- Defining the additional requirements needed to establish the GCOS; new observing systems, data collection and management, communications, data exchange, etc

- Advising existing and future national and international research programmes on how their data can contribute to the GCOS.

Following this, an implementation plan can be developed. There was considered to be a degree of urgency in this task and it was recommended that the Committee and Office be established in 1991.

The report from the meeting has been published:

The Global Climate Observing System. A proposal prepared by an ad hoc group, convened by the Chairman of the Joint Scientific Committee for the World Climate Research Programme, Winchester, UK, 14-15 January 1991 (1991). WCRP Report 56. 36 pp., appendices. Also published in brochure form by the Meteorological Office, UK (1991), 21 pp. This article is based on the executive summaries of those publications ■



Dr. Sanga Sabhasri, Minister of Science, Thailand, visits the Royal Swedish Academy of Sciences on 31 May 1991 to discuss Thai scientific activities in environmental research, including participation in the IGBP.

Funding the IGBP

Since its inception in 1986 the Secretariat is housed at the Royal Swedish Academy of Sciences in Stockholm. The institutional support of the Academy was vital to the initial development of the Programme, and continues to be significant.



The Royal Swedish Academy of Sciences, Stockholm. Watercolor by Lars Dhejne, winter, 1981.

Financial contributions to the initial IGBP planning phase (1986-1990) were made by ICSU and its national members, and other international and national organizations. International organizations were: UNEP, Unesco, Commission of the European Communities, Organization of American States, African Biosciences Network, Commonwealth Science Council, and the Third World Academy of Sciences

Support has also been obtained from the following national organizations, foundations and private industry: Wissenschaftskolleg zu Berlin, International Development Research Centre (Canada), National Science Foundation (USA), Andrew W. Mellon Foundation (USA), Rockefeller Foundation (USA), Shell Netherlands, Swedish Natural Science Research Council, Swedish Agency for Research Cooperation with Developing Countries, Swedish Research Council for Agriculture and Forestry, IBM Sweden and Hewlett Packard Sweden. This support ranged from large donations for overall activities to specific contributions for IGBP planning meetings or publications. We gratefully acknowledge here again our appreciation for their confidence and for the vital help they provided.

Support from National Members

For continuous yearly support for international planning, coordination and

implementation of the programme, the contributions of the 47 national members of the IGBP are crucial. These contributions vary greatly from country to country. The recent 2nd meeting of National IGBP Committees (London, UK, 4-6 February 1991) recommended that minimum level of future national contributions to the IGBP planning and coordination should be based on their relative financial contributions to the United Nations, and that a total of at least \$1.2 million should be committed each year from 1992.

Support from Industry

In addition to the generous support from Shell Netherlands, we have just received a very generous contribution for 1990-1992 from the Netherlands Electricity Production Company (N. V. Samenwerkende elektriciteitsproduktiebedrijven). Additional funds will be essential for the early implementation phase. We are particularly in need of such inputs from industry and charities during the present phase of the IGBP. Any persons or bodies who may be able to provide financial assistance, or could assist in obtaining such support from elsewhere, should contact either the Secretariat in Stockholm or the Treasurer of the IGBP Scientific Committee (Prof. Peter S. Liss, School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, United Kingdom, Tel: (+44-603) 592 563; Fax: (+44-603) 507 719).

The International Group of Funding Agencies

The International Group of Funding Agencies for Global Change Research (IGFA) was established in 1990 to address the issue of funding global change research (see Global Change Newsletter No. 4). It is a partnership of national agencies which fund global change research programmes and other activities supporting such research. It was created to facilitate international global change research in the natural, social and economic sciences, by bringing the perspective of these national funding agencies to the strategic planning and implementation of such research. The role of IGFA is to:

- exchange information on national global change research programmes, supporting programmes, and facilities
- discuss approaches to the integration and phasing of the implementation of global change research in the light of

available resources

- promote coordination of access to, and deployment of, specialized research facilities
- optimize allocation of national contributions to global change research.

The third IGFA meeting took place in Brighton (UK) on 1-3 May, 1991.

At the meeting Professor Liss, the IGBP Treasurer, presented the plans for the international coordination of IGBP projects and the corresponding financial needs in order to perform this task. He explained the necessity for long-term funding of the IGBP Secretariat in order to secure the rational build-up of the complex structure of IGBP research.

The next meeting of IGFA will take place in the Netherlands in the fall of this year ■

Personnel at the IGBP Secretariat

Professor Thomas Rosswall was re-appointed Executive Director of the IGBP by the ICSU Executive Board for a second term beginning in September 1990. He is a microbiologist and professor at the Department of Water and Environmental Studies of the University of Linköping, Sweden. Professor Rosswall was previously Secretary-General of the Scientific Committee for Problems of the Environment (SCOPE) of ICSU, and was initially

appointed Executive Director of IGBP in September 1986.

Following the return to the United States in September 1990 of Dr. Hassan Virji, Deputy Executive Director and Dr. Dennis Ojima, Programme Officer, we were fortunate in having Carolyn Malmström, biologist, as Programme Officer for the period January 1991-September 1991. She will then attend Stanford University, California, for her doctoral studies.

We now welcome on board a new Deputy Executive Director, Dr. Phillip Williamson, who comes to Sweden from the Plymouth Marine Laboratory. He has been working in scientific administration with the UK Natural Environment Research Council since 1981, most recently as Project Manager for the UK contribution to JGOFS. Dr. Williamson has also carried out ten years of research in metal pollution, population dynamics and ecological energetics, in both terrestrial and marine environments.

We also welcome Dr. Ye Weizuo, a meteorologist from China, who has come to Stockholm on an exchange programme between the Chinese Academy of Sciences and the Royal Swedish Academy of Sciences. Dr. Ye comes to Stockholm from the Institute of Atmospheric Physics in Beijing. Research on his Ph.D. was done in Boulder, Colorado (USA) at the National Centre for Atmospheric Research, where Dr. Ye was an Advanced Study Programme Student.

The administrative staff is composed of a Finance Officer, Elise



Staff at the IGBP Secretariat, from left to right: Lisa Wanrooy-Cronqvist, June Barwick, Phillip Williamson, Suzanne Nash, Thomas Rosswall, Ye Weizuo, Elise Wännman, Cecilia Edlund. Absent at the time of the picture: Carolyn Malmström

Wännman; an Information Officer, Suzanne Nash; the Assistant to the Executive Director, Cecilia Edlund, and the Assistant to the Deputy Executive Director, Lisa Wanrooy-Cronqvist. For the next year, June Barwick, from the UK and now a resident in Sweden, who will replace Ms. Cronqvist when she is on maternity leave ■

Publications

IGBP Report Series

Members of IGBP Committees and liaison persons with ICSU bodies receive all IGBP reports. A number of libraries have been identified as depositories of IGBP reports under an agreement with the International Association of Technological University Libraries. The names of these libraries will appear in Newsletter No. 7, September 1991, with a complete list of reports. Each one presents either a study relating to IGBP activities, an account of a meeting, or documents prepared for a meeting. IGBP reports are distributed free upon request to individuals and bodies with relevant professional interests.

Two IGBP reports have been mailed to everybody on our mailing list (which now numbers 6000 names): Report No. 12 "The Initial Core Projects" and Report No. 15 "Global Change System for Analysis, Research and Training (START)". When multiple copies of reports are ordered by institutions, we must invoice the cost of mailing and ask for a contribution to the printing expenses. Listed below are IGBP reports which have been published in the last 12 months.

No. 10. The Land-Atmosphere Interface. Report on a Combined Modelling Workshop of IGBP Coordinating Panels 3, 4, and 5. Brussels, Belgium, 8-11 June, 1989. Edited by S. J. Turner and B. H. Walker (1990). 39 pp.

No. 11. Proceedings of the Workshops of the Coordinating Panel on Effects of Global Change on Terrestrial Ecosystems. I. A Framework for Modelling the Effects of Climate and Atmospheric Change on Terrestrial Ecosystems, Woods Hole, USA, 15-17 April, 1989. Edited by B. H. Walker. II. Non-Modelling Research Requirements for Understanding, Predicting, and Monitor-

ing Global Change, Canberra, 29-31 August 1989. Edited by B. H. Walker and S. J. Turner. III. The Impact of Global Change on Agriculture and Forestry, Yaoundé, 27 November-1 December, 1989. Edited by S. J. Turner, R. T. Prinsley, D. M. Stafford Smith, H. A. Nix and B. H. Walker (1990). 108 pp.

No. 12. The International Geosphere-Biosphere Programme: A Study of Global Change (IGBP). The Initial Core Projects (1990). 330 pp.

No. 13. Terrestrial Biosphere Exchange with Global Atmospheric Chemistry. Terrestrial Biosphere Perspective of the IGAC Project: Companion to the Dookie Report. Report on the Recommendations from the SCOPE/IGBP Workshop on Trace-Gas Exchange in a Global Perspective. Siguna, Sweden, 19-23 February, 1990. Edited by P. A. Matson and D. S. Ojima (1990). 103 pp.

No. 14. Coastal Ocean Fluxes and Resources. Report of a CP2 Ad Hoc Workshop Tokyo, Japan, 19-22 September 1989. Edited by P. Holligan (1990). 53 pp.

No. 15. Global Change System for Analysis, Research and Training (START). Report of a Meeting at Bellagio, December 3-7, 1990. Edited by J. A. Eddy, T. F. Malone, J. J. McCarthy and T. Rosswall (1991). 40 pp.

New Reports:

No. 16. Report of the IGBP Regional Workshop for South America, São José dos Campos, SP, Brazil, 5-9 March 1990 (1991). 57 pp.

The workshop discussed, in a South American context, past global changes, the effects of climate change on terrestrial ecosystems, the role of ocean processes in global change, land transformation and global change processes, the importance of the Andes for general circulation models, and regional research centres. Recommendations promote the role of South American science in global change research.

No. 17. Plant-Water Interactions in Large-Scale Hydrological Modelling. Report of a Workshop, Vadstena, Sweden, 5-8 June 1990, organized as a contribution to the International Geosphere-Biosphere Programme (IGBP) of ICSU and the International Hydrological Programme (IHP) of Unesco by IGBP, IAHS and IHP (1991). 43 pp.

The workshop addressed plant-water inter-

relationships at landscape to continental scales: the spatial pattern at landscape level of the dynamics of water flows and water-borne fluxes of dissolved and suspended matter; plant/vegetation characteristics and properties affecting return flow to the atmosphere; methodological issues of large-scale modelling; and research in humid tropical, semi-arid and temperate zones.

No. 18:1. Report of the Recommendations of a Workshop, New Delhi, India, February 11-15, 1991. Edited by R. R. Daniel (1991). 57 pp.

Recommendations of the Workshop address issues of prime concern to Asian countries, with reports and recommendations from Working Groups on IGBP Core Projects and key activities.

Other IGBP Publications

Joint Global Ocean Flux Study
JGOFS Report Series published by the Scientific Committee on Oceanic Research (SCOR):

No. 1. Report of the Second Session of the SCOR Committee for JGOFS, The Hague, September 1988.

No. 2. Report of the Third Session of the SCOR Committee for JGOFS, Honolulu, September 1989.

No. 3. Report of the JGOFS Pacific Planning Workshop, Honolulu, September 1989.

No. 4. North Atlantic Bloom Experiment - Report of the First Data Workshop, Kiel, March 1990.

No. 5. Science Plan, August 1990.

No. 6. Core Measurement Protocols - Report of the Core Measurement Working Groups.

No. 7. JGOFS North Atlantic Bloom Experiment, International Scientific Symposium. Abstracts. Washington, November 1990.

No. 8. Report of the International Workshop on Equatorial Pacific Process Studies, Tokyo, April, 1990.

Oceans, Carbon and Climate Change. An Introduction to the Joint Global Ocean Flux Study. SCOR/ICSU (1990). 12 pp.

Copies of JGOFS publications may be obtained from Ms. E. Tidmarsh, Executive Director, SCOR, Department of Oceanography, Dalhousie University, Halifax, Nova Scotia B3H 4J1, Canada, Tel: (+1-902) 494 8865, Fax: (+1-902) 494 3877, E-mail: E.Tidmarsh (Omnet).

The International Global Atmospheric Chemistry Project (IGAC)

The International Global Atmospheric Chemistry (IGAC) Programme. A Core Project of the International Geosphere-Biosphere Programme. Editor, Ian E. Galbally. IAMAP Commission on Atmospheric Chemistry and Global Pollution, Mordialloc, Victoria, Australia (1989). 55 pp. (Report of the IGAC Workshop at Dookie College, Victoria, Australia, 7-11 November 1988) Copies available from I. E. Galbally, CSIRO Division of Atmospheric Research, Private Bag 1, Mordialloc, Victoria 3195, Australia.

Publications relating to National IGBP programmes

Belgium

Synthesis of the Belgian Research Potentialities for the National IGBP "Global Change" Programmes. A Basic Framework Made for the Prime Ministers' Services for Programming of Science Management by the Belgian National Group IGBP "Global Change". Belgian Royal Academies of Sciences (1990). 31 pp.

France

Evolution of the Climate and the Global Environment. The French contribution in 1990. P. Buat-Ménard (ed.). Paris, French Ministry of Research and Technology (1991). 50 pp.

Norway

Norwegian Contributions to IGBP. Report from the Symposium at Fornebu, March 29th 1990. Norwegian National IGBP Committee (ed). Oslo, Norwegian National Committee for Environmental Research (1990). 58 pp.

South Africa

Conference on Geosphere-Biosphere Change in Southern Africa (1990). In: South African Journal of Science, 86: 278-472.

IGBP-Related Reports

L'effet de serre et ses conséquences climatiques. Evaluation scientifique. Paris, Académie des Sciences (1990). 182 pp. (Rapport no. 25)

Global Change: Issues for the Southern Hemisphere. Proceedings of a Conference held at Mbabane, Swaziland, December 11-16, 1988. Edited by B. H. Walker & R. G. Dickson (1991). Climatic Change 18(2-3): 115-369.

Global Changes of the Past: Papers

arising from the OIES 1989 Global Change Institute, Snowmass, Colorado, 24-July-4 August, 1989. Edited by Raymond S. Bradley. (1991). 514 pp. (Order from UCAR/OIES, 89 GCI Book Order, P.O. Box 3000, Boulder, CO 80307-3000, USA, USD 38.00)

The Global Climate Observing System. A proposal prepared by an ad hoc group, convened by the Chairman of the Joint Scientific Committee for the World Climate Research Programme, Winchester, UK, 14-15 January 1991 (1991). WCRP Report 56. 36 pp., appendices. The report also published in brochure form by the Meteorological Office, UK, 21 pp.

One Earth, One Future: Our Changing Global Environment, by Cheryl Simon Silver with Ruth S. DeFries, for the National Academy of Sciences. Washington, National Academy Press (1990). 196 pp.

IGBP and Related Meetings

IGBP Meetings

1991

9-12 July, Cambridge, UK
Joint Global Ocean Flux Study (JGOFS) Science Panel

2-9 August, Beijing, China
Symposium on Past Global Changes (PAGES) in connection with INQUA XIII Congress

11-24 August, Vienna, Austria
Past Global Changes (PAGES) Open Meeting, in connection with IUGG 20th General Assembly

25-27 August, Amsterdam, Netherlands
START Standing Committee

28-31 August, Stockholm, Sweden
3rd Meeting of the IGBP Scientific Committee

9-13 September, Wageningen, The Netherlands

GCTE Focus 3, Global Change Impact on Agriculture and Forestry

10-12 September, San Vincenzo (Toscany), Italy

Biospheric Aspects of the Hydrological Cycle (BAHC) Scientific Steering Committee

27-29 September, Stockholm, Sweden
2nd Meeting of the IGBP/ISSC ad hoc Working Group on Land-Use/Cover Change

30 Sept-3 October, Bermuda
Biological Station
JGOFS Scientific Steering Committee Sixth Session

4-5 October, Bermuda Biological Station

JGOFS Indian Ocean Planning Group, Second Meeting

16-19 October, Cambridge, UK
JGOFS Southern Ocean Modelling Workshop

December, Singapore
Asian IGBP National Committees

IGBP Meetings Under Organization for 1991:

JGOFS Equatorial Pacific Ocean Planning Group

Global Analysis, Interpretation and Modelling (GAIM) Core Project Planning Committee

1992

8-10 January, Tokyo, Japan
2nd Scientific Committee IGBP Officers Meeting

1st quarter, Niamey, Niger
IGBP Regional Conference for Africa

IGBP-Related Meetings

1991

10-13 July, Lima, Peru
International Symposium on Former ENSO Phenomena in Western South America: Records of El Niño events.

22-26 July, College Park, MD, USA
NATO Advanced Research Workshop: Prediction of Interannual Climate Variations

22-27 July, Lusaka, Zambia
Regional Workshop on Solar Radiation, Environment and Climate Change

26-30 August, Coblenz, Germany
NATO Advanced Research Workshop: Hydrological Data in Support of Climate Change Studies

1-6 September, Amsterdam, Netherlands

IUBS General Assembly, Symposium on Biological Diversity and Global Change

8-13 September, Capetown, South Africa

SCOR Symposium: Benguela Trophic Functioning

8-20 September, Il Ciocco, Italy
NATO Advanced Study Institute: The Global Carbon Cycle

16-18 September, Copenhagen, Denmark

First Nordic Interdisciplinary Research Conference on the Greenhouse Effect 18-21 September, Bremerhaven, Germany

Scientific Committee on Antarctic Research (SCAR) BIOMASS Colloquium 23-27 September, Bremen, Germany

SCAR International Conference on Antarctic Science - Global Concerns 30 September-11 October, Glücksburg, Germany

NATO Advanced Research Workshop: Global Cycle of Methane - Sources, Sinks, Distributions and Role in Global Change 6-11 October, Beaverton, OR, USA

NATO Advanced Research Workshop: Second Pacific International Space Year Conference 13-15 October, Kona, Hawaii, USA

NATO Advanced Research Workshop: The Impacts of Global Change on Coastal Oceans 14-17 October, Toulouse, France

NATO Advanced Research Workshop: Climate Change - The Biological Implications 15-19 October, Clemson, SC, USA

Society of Latin American Specialists in Remote Sensing (SELPER) Fifth Symposium on Remote Sensing 28 October-1 November, Cusco City, Peru

NATO Advanced Research Workshop: Modelling Sustainable Development and Global Environmental Change 24-29 November, Vienna, Austria

Agenda of Science for Environment and Development into the 21st Century (ASCEND 21) 24-29 November, Vienna, Austria

IGU Seminar on Monitoring Geosystems: Perspectives for the 21st Century 6-9 December, Delhi, India

66th Dahlem Workshop, Global Changes in the Perspective of the Past 8-13 December, Berlin, Germany

66th Dahlem Workshop, Global Changes in the Perspective of the Past 8-13 December, Berlin, Germany

1992

NATO Advanced Research Workshop: Biogeochemical Ocean Atmosphere Transfers (IGAC-JGOFS) 27 January-1 February, Fortaleza (Ceará), Brazil

International Conference on the Impacts of Climatic Variations and Sustainable Development (ICID) 27 January-1 February, Fortaleza (Ceará), Brazil

First International Conference on Carbon Dioxide Removal 22-27 March, Garmisch-Partenkirchen, Germany

EUROTRAC Symposium 1992: European Experiment on the Transport and Transformation of Environmentally Relevant Trace Constituents in the Atmosphere 22-27 March, Garmisch-Partenkirchen, Germany

NATO Advanced Research Workshop: High Spectral Resolution Infrared Remote Sensing for Earth's Weather and Climate Studies 24-27 March, Palaiseau, France

NATO Advanced Research Workshop: Towards a Model of Ocean Biogeochemical Processes 30 March-4 April, Munich, Germany

European International Space Year Conference: Space in the Service of the Changing Earth 30 March-4 April, Munich, Germany

NATO Advanced Research Workshop: Towards a Model of Ocean Biogeochemical Processes 3-9 May, Southampton, UK

2nd United Nations Conference on Environment and Development (UNCED) 1-12 June, Rio de Janeiro, Brazil

Ente Colombo '92: Ocean Management in Global Change 22-26 June, Genoa, Italy

4th International Conference on Paleooceanography: Short and Long Term Global Changes 21-25 September, Kiel, Germany

4th International Conference on Paleooceanography: Short and Long Term Global Changes 21-25 September, Kiel, Germany

4th International Conference on Paleooceanography: Short and Long Term Global Changes 21-25 September, Kiel, Germany

Volvo Environmental Prize



Professor Paul Crutzen, member of the Special Committee for the IGBP from 1987 to 1990, has been awarded the Volvo Environmental Prize for 1991. He has been selected for his research in atmospheric chemistry and its relation to the greenhouse effect. The award will be given on 11 November 1991.

Liaison persons from ICSU

Scientific Members

CASAFA	Dr. F. W. G. Baker
CODATA	Ms. Phyllis Glaeser
COSPAR	Prof. George Ohring
IAHS	Prof. Malin Falkenmark
IGU	Prof. Vladimir M. Kotlyakov
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GLOBAL CHANGE NEWSLETTER

Global Change (IGBP) Newsletter
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European Environmental Research Organization Fellowships

The EERO will award a second round of long-term post-doctoral fellowships in 1991 for young scientists wishing to work in a European laboratory that is not in the applicant's home country. Europe for this purpose is broadly defined and includes northern and eastern regions; laboratories in Israel are also eligible.

The main focus of the EERO programme is on toxic and polluting chemicals in the environment. Areas of study can include analytical methods, physical transport processes, chemical and biological fate, ecological impacts, the development of processes for removal, the identification of less toxic and more readily degradable alternatives, mathematical modelling in relation to these subjects.

Candidates must hold a Ph.D. or anticipate receiving one before taking up an award. They should already be working in Europe, although a candidate from elsewhere can be considered if he brings exceptional skills to the receiving laboratory. Provision is made for a travel grant, a subsistence allowance and a bench fee for the receiving laboratory. The deadline for receipt of long-term fellowship applications is 31 August 1991 and successful candidates will be notified in November. The duration of a fellowship is one or two years.

Short-term fellowships, of one week to three months duration, are also available. These are for scientists who wish to initiate collaboration, learn newly developed techniques or use special facilities in a laboratory in another European country. Awards are not limited to Ph.D. holders. Provision is made for travel and subsistence, but not for a bench fee.

Applications for short-term fellowships can be made at any time and are decided upon soon after receipt of the completed form. Application forms and further details may be obtained from:

*EERO, P.O. Box 191, 6700 AD, Wageningen, The Netherlands,
Fax: (+31-8370) 848 18.*



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