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REPORT OF THE 36th EXECUTIVE COMMITTEE MEETING OF SCOR

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1.0 OPENING¹

1.1 Opening Remarks and Administrative Arrangements

SCOR President Robert Duce (USA) opened the meeting, welcomed participants, and thanked the Russian SCOR Committee for the invitation to Moscow. Russia has a long participation in SCOR, including the service of Konstantin Fedorov as SCOR President (1976-1980), and Lev Zenkevich (1960-1962), Vladimir Kort (1962-1968), A.S. Monin (1968-1976), Alexei Kuznetsov (1990-1994), and Sergey Lappo (1996-2000) as SCOR Vice-Presidents. Duce particularly thanked Sergey Shapovalov (Executive Secretary of the Russian SCOR Committee) for his work in organizing the meeting.

Sergey Lappo (Russia), Director of the P.P. Shirshov Institute of Oceanology, welcomed the Executive Committee to Moscow. Lappo told the participants that several SCOR working groups had stimulated the development of Russian national ocean science activities. SCOR's ability to combine the efforts of scientists from different countries strengthens international science. During the past decade many changes took place in Russia, including a strengthened government interest in science. During this period, several Russian scientists were involved in SCOR groups, such as WG 108 on Double Diffusion (Yuli Chashechkin, WG 108 co-chair). SCOR working group activities are aimed at key processes and phenomena, complement its large programs, and stimulate international cooperation. Russian participation increased during the past decade, especially in polar programs. This happened within the framework of a Russian national program called "World Ocean," coordinated by the Russian Academy of Sciences (RAS). The RAS Institute of Oceanology carries out research worldwide, especially in the Atlantic Ocean from Greenland to Antarctica. Lappo reminded meeting participants that they would hear more about Russian ocean science in the scientific sessions later in the week. (The meeting included a full day of presentations about the latest developments in ocean sciences in Russia; see Annex 1 for a list of the presentations.) He wished participants a successful meeting and good time in Moscow.

Robert Duce thanked Lappo for his comments and for the preparations of the Russian hosts. Noting that the meeting participants were looking forward to the science sessions, Duce asked them to introduce themselves (see Annex 2 for a complete list).

1.2 Approval of the Agenda

Additions or modifications to the agenda may be suggested prior to approval of the final version. One change was made to the agenda distributed before the meeting: the President of SCAR,

¹ The background book from the meeting provides more formation about each agenda item and will be available at <http://www.jhu.edu/scor/2003-EC-Meeting.htm> for at least one year.

Prof. Jörn Thiede, would speak about SCAR on Tuesday morning. The agenda was approved as amended (Annex 3).

1.3 Report of the SCOR President

Robert Duce made a brief report that reviewed SCOR activities since the XXVIth General Meeting in October 2002 in Sapporo, Japan.

SCOR's long-term reputation is related to the success of its activities, such as working groups and projects with other organizations, progress of which would be reported over the next few days. Duce reported that during the past year he had almost daily contact with Ed Urban and frequent contact with SCOR's Past-President, John Field (South Africa), and its Secretary, Julie Hall (New Zealand). Duce thanked the Executive Committee members for their time and dedication. In early January, Duce spoke at the OCEANS Open Science Meeting and participated in the development of the "Ocean Vision" statement that IGBP is developing to set a framework for the Oceans box in the IGBP II structure for international activities for next decade. Duce, Hall, and Urban attended the IGBP-SC meeting in Punta Arenas, Chile in late January and Duce gave a presentation regarding SCOR activities of relevance to IGBP. IGBP is initiating new efforts called "fast track initiatives," similar to SCOR working groups, but with one- to two-year durations. Duce suggested a fast track initiative on the global iron cycle. Duce and Peter Liss developed a brief proposal for the initiative, which Urban put into ICSU proposal format. The proposal was submitted by IGBP as the primary applicant, being broader than oceans, with SCOR as a supporting applicant. ICSU approved the proposal, as described in greater detail later in the meeting. In February, Duce made a presentation to ICSU's Priority Area Assessment on Environment and its Relation to Sustainable Development, which was meant to review performance of individual ICSU organizations and how they fit into a coherent ICSU portfolio of environmental activities, and to identify any gaps among these activities. The draft report was circulated immediately before the meeting and Duce expressed his pleasure with the panel's comments about SCOR. In May, Duce met in Ottawa with the Canadian National Committee for SCOR, while attending the Canadian SOLAS meeting. In June, he attended the IOC Assembly and made a presentation about SCOR activities relevant to IOC. At the IOC meeting, Duce encouraged inclusion of rigorous science in the Global Marine Assessment and spoke about data concerns. While attending the International Union of Geodesy and Geophysics (IUGG) Assembly in Sapporo, Japan, in July, Duce also attended part of the first meeting of the IAPSO/SCOR WG 121 on Ocean Mixing. Also in July, Duce and Urban made presentations to the U.S. National SCOR Committee (the U.S. National Research Council's Ocean Studies Board) in Woods Hole, Massachusetts, USA. William Burnett also gave a scientific talk on submarine groundwater discharge and the activities of SCOR/LOICZ WG 112 on this topic. Duce also noted that the Census of Marine Life (CoML) would be having a special session following the SCOR meeting (see Annex 4 for a list of presentations.)

1.4 Report of the SCOR Executive Director

Ed Urban expressed his pleasure that SCOR was finally in Russia for its first annual meeting there. He reviewed his written report. SCOR finances were in good shape in 2003, particularly due to Russia and France paying their dues in arrears, which is much appreciated. This has also

been a good year in terms of partnerships with other organizations. SCOR sent a representative to the SCOPE Executive Committee meeting and SCOR's links with SCAR have also improved. Relations with IOC and IGBP continue to be productive. SCOR's visibility in the international marine science community is also increasing, through presentations, newsletter articles, and expansion of the SCOR Web site.

1.5 Appointment of an *Ad Hoc* Finance Committee

The SCOR Executive Committee appointed a Finance Committee before the Executive Committee meeting, to allow them a chance to review the audit report by SCOR's accountant and other financial information from the SCOR Secretariat. Finance Committee members must be Nominated Members attending the annual meeting, but cannot be members of the Executive Committee. The 2003 Finance Committee was chaired by Bjorn Sundby (Canada), with the other members being K.K. Liu (China-Taipei), and Catherine Jeandel (France).

1.6 *Ad Hoc* Committee to Review the Disciplinary Balance of SCOR's Activities

The Executive Committee meeting in 1999 agreed that at future SCOR meetings, after the consideration of working group proposals is complete, the current disciplinary balance of SCOR groups should be assessed. Scientific gaps should be identified and communicated to national committees when the next request for working group proposals is sent. The 2002 General Meeting decided to retain the same members (John Field, Laurent Labeyrie, and Roberto Purini). Two of these individuals were not present at the Moscow meeting and it was decided to postpone the next review of disciplinary balance until the 2004 meeting, since the report at the 2002 meeting indicated a good balance of activities and not many groups have been formed or disbanded since then. John Field was asked to review the input received from previous WG chairs and to present it at the 2004 SCOR General Meeting.

2.0 WORKING GROUPS

2.1 Disbanded Working Groups

2.1.1 WG 93—Pelagic Biogeography

Annelies Pierrot-Bults (The Netherlands) reported at the 2002 General Meeting that the English version of biogeography terms was ready to publish, and Spanish terms were to be published soon. Meeting participants suggested that the initial documents could be posted on the SCOR Web site while the other translations are being sought. Pierrot-Bults appealed for help with translations in other languages, especially Russian.

2.1.2 WG 107—Improved Global Bathymetry

This group's report was published in the IOC Manuals and Guides series in 2002, soon after the SCOR General Meeting and the group was disbanded. The Executive Committee requested that the WG chair produce (or commission) a summary of the report for publication as an *EOS* article. A follow-up letter to agencies holding bathymetric data was to be prepared and other actions were to be considered. Ed Urban reported that the short article in *EOS* about important issues in bathymetry and a letter to agencies about the issues have not yet been completed. The letter to agencies has been drafted and the Executive Committee has reviewed it. The primary issue for the letter, which will be sent to the U.S. National Oceanographic Data Center and other similar agencies in other countries, is that there are many data available, but they are difficult to use because the software provided is complicated to use.

2.1.3 WG 108—Double Diffusion

The group's work is completed and a special issue of *Progress in Oceanography* was published in 2003. The WG was thanked and disbanded. The publication will be distributed to SCOR's list of libraries in developing countries.

2.2 Current Working Groups

The Executive Committee Reporter for each working group presented an update on working group activities and progress, and made recommendations on actions to be taken. (In some cases, the working group chair also presented comments.) The Executive Committee made preliminary decisions, based on the progress of working groups and the merits of the requests, whether funding should be provided for 2004 activities of working groups that requested funds. The Finance Committee took into account the recommendations of the Executive Committee as it developed the 2004 SCOR budget, which was then subject to final approval by the Executive Committee.

2.2.1 SCOR/IUPAC WG 109—Biogeochemistry of Iron in Seawater

Robert Duce, the Reporter for this working group, reminded meeting participants that the first book of the group was produced in 2001. This book already is well known as an authoritative publication. A subgroup on iron standards was set up at the Amsterdam General Meeting (1998) and met at the 2000 Ocean Sciences Meeting in San Antonio, Texas; an intercalibration of standards was underway at the time of the 2000 SCOR General Meeting. The subgroup met in late 2002 to discuss the results of the intercomparison and to determine how these results will be published. The results of these discussions are being prepared for inclusion in a paper to be submitted to *Marine Chemistry*. The sub-group on standards for determination of iron in low concentrations worked to see if there could be a certified standard, but they were not successful. The measurement procedures still are not accurate enough. The U.S. National Science Foundation (NSF) is funding further work, including a second exercise that will be held in the Pacific Ocean region.

2.2.2 WG 111—Coupling Winds, Waves and Currents in Coastal Models

The group convened a meeting of authors of the book in late 2002 in Goa, India. The group is developing a book tentatively entitled *Coupled Coastal Wind-Wave-Current Dynamics*, which they hope will be published by a leading publisher in 2005. The draft outline of the book was given in the meeting background book. The group's activities are funded by the U.S. Minerals Management Service and U.S. National Aeronautics and Space Administration.

2.2.3 SCOR/LOICZ WG 112—Magnitude of Submarine Groundwater Discharge and its Influence on Coastal Oceanographic Processes

Robert Duce, the Reporter for this group, stated that this has been an active, successful working group. It has published several papers and reports, based on experiments conducted in several different locations worldwide. The planned products of this working group include a special issue of the journal *Biogeochemistry* (due to be published before the end of 2003) and a chapter in the synthesis book for the Land-Ocean Interactions in the Coastal Zone (LOICZ) project. The group will be disbanded upon the publication of its special journal issue.

2.2.4 SCOR/IMAGES WG 113—Evolution of the Asian Monsoon in Marine Records: Comparison between Indian and East Asian Subsystems

Marine Geology has agreed to publish a special volume of the papers contributed to the working group's second workshop (all papers have been reviewed and revised and the publication process was underway). The third and final workshop was held in late 2002 in France. A review paper is being prepared based on the results of the first and third workshops, to be published in *Quaternary Science Reviews* in late 2004. This is the second publication of the group.

2.2.5 WG 114—Transport and Reaction in Permeable Marine Sediments

Robert Duce reported on behalf of Laurent Labeyrie, the Executive Committee Reporter, that this working group has enhanced its Web site and convened a Gordon Research Conference (GRC) on their topic in 2003, the latter involving several members of WGs 114 and 112. The GRC this year was unusual in that more than 50% of the participants were from outside North America. The group requested permission to remain dormant until 2006, so that they can serve as an organizing committee for the next GRC on this topic. The proposed timing is set to avoid conflict with the GRC on chemical oceanography, which will repeat in 2005. It seems likely that additional funding will not be required from SCOR. There was considerable discussion about whether the group should be allowed to remain inactive and whether some kind of document should be required from the group. The Executive Committee decided that the group should be allowed to remain dormant, but only if it produces a synthesis of seminal published papers, including a significant synthesis of these papers. Elizabeth Gross added that this is the second time a SCOR working group has been responsible for the establishment of a new series of GRC meetings, the first being WG 86, which established the ongoing GRC on Polar Marine Science.

2.2.6 WG 115—Standards for the Survey and Analysis of Plankton

The working group will meet for the second time in Concepción, Chile in November 2003. Song Sun (China-Beijing) was added as a Full Member of the working group, and Erika Head (Canada) and Juha Flinkman (Finland) were added as Associate Members of the WG in 2003.

The group plans to meet for its third and final time in early 2005. Annelies Pierrot-Bults, the Executive Committee Reporter for the group, noted that their Web site is on line. No funding request was made for 2004. Julie Hall noted that there seems to be a lack of connection between GOOS and ICSU bodies. This working group could provide a strong linkage between the science community and GOOS, through the group's review of methodologies that could be important for GOOS. Ed Urban was asked to deliver this suggestion to the working group chair and to suggest that they seek a closer linkage with GOOS.

2.2.7 WG 116—Sediment Traps and ²³⁴Th Methods for Carbon Export Flux Determination

The working group was asked by SCOR not to meet in 2002, because of SCOR budget limitations. The group's 2003 meeting in China was postponed due to the Severe Acute Respiratory Syndrome epidemic. The group will meet in November 2003 and is requesting permission to convene its final meeting in 2004 to coincide with a larger meeting on this topic in the United States. SCOR agreed to this request.

2.2.8 WG 118—New Technologies for Observing Marine Life

The working group met most recently in Lima, Peru in October 2002 and will meet for the third and final time in Washington, D.C. in October 2003 in conjunction with a major meeting of the Census of Marine Life (CoML) project. The group is funded by the Alfred P. Sloan Foundation. Annelies Pierrot-Bults, the Executive Committee Reporter for this group, noted that the Sloan Foundation has asked for the group to continue in an advisory capacity to CoML pilot projects for at least another three years. (Jesse Ausubel confirmed that Sloan would consider a proposal from SCOR for funding for the continued advisory activities.) Ed Urban noted that the group should be transformed from a working group to a panel, since it would now be an ongoing activity. Julie Hall appealed for closer links of this group with GOOS, since development and review of technologies is needed for GOOS. Julie Hall, Gordon McBean (ICSU) and Umit Unluata (IOC) were asked to discuss GOOS links with SCOR activities. The transformation of the working group to a standing panel was approved. The working group should prepare a new proposal to the Sloan Foundation.

2.2.9 SCOR/IOC WG 119—Quantitative Ecosystem Indicators for Fisheries Management

The working group met most recently in Cape Town, South Africa in December 2002 to evaluate its progress and plan its large symposium for Paris on 31 March-3 April 2004. The workshop is being funded by IOC, the U.S. National Marine Fisheries Service, the Food and Agriculture Organization (FAO), the North Pacific Marine Sciences Organization (PICES), the International Council for the Exploration of the Seas (ICES), several French agencies, the Pew Foundation's Sea Around Us project and the Global Ocean Ecosystem Dynamics (GLOBEC) project. A special issue of the *ICES Journal of Marine Science* will be produced from the symposium. John Field, the Executive Committee Reporter for the group, added that this is an enthusiastic working group and he reviewed plans for the conference in 2004. Funding for scientists from developing countries was requested from SCOR and approved (see later section).

2.2.10 WG 120—Marine Phytoplankton and Global Climate Regulation: The *Phaeocystis* Species Cluster As Model

Julie Hall, the Executive Committee Reporter for this group, reported that the working group's second meeting, planned for May 2003 in Savannah, Georgia, USA, was cancelled due to concerns about SARS and the war in Iraq. The working group has rescheduled its meeting in Savannah for December 2003. The chair's report made no request for a meeting in 2004.

2.2.11 IAPSO/SCOR WG 121—Ocean Mixing

The working group held its first meeting in Sapporo, Japan in July 2003, in conjunction with the IUGG meeting there. One additional Associate Member (Theo Gerkema, The Netherlands) was approved by the Executive Committee in the past year. One additional Full Member (Hans Burchard, Germany) and several additional Associate Members (Mark Merrifield, USA and Rob Pinkel, USA) were proposed as a result of discussions at the group's first meeting. The proposal to the U.S. Office of Naval Research (jointly by SCOR and the International Association for the Physical Sciences of the Ocean [IAPSO]) to fund the group's meetings was unsuccessful, but a revised version was to be submitted in 2004. Robert Duce reported that he attended part of the group's first meeting in July 2003, in conjunction with the IUGG General Assembly. The group requested to change its name from "Deep-Ocean Mixing" to "Ocean Mixing." Its terms of reference refer to deep-ocean basins, but they don't only look at deep mixing, so the change was approved. The group will convene a major conference in October 2004 in Victoria, B.C., Canada, and will hold a short working group meeting afterward.

2.2.12 SCOR/LOICZ/IAPSO WG 122—Estuarine Sediment Dynamics

SCOR asked the proponents of this working group to resubmit their proposal with revised terms of reference and membership, which they did. The group was approved by the Executive Committee in correspondence in 2003 and will be co-funded by LOICZ (half of the total cost) and co-sponsored by IAPSO. Ed Urban reported that the group's co-chairs will meet at the upcoming Estuarine Research Foundation meeting to develop detailed plans for their first meeting in 2004.

2.3 New Working Group Proposals

Five working group proposals were received by the SCOR Secretariat for consideration at the meeting. Ed Urban reported that SCOR could fund one or two new working groups in 2004. The proposal on "Investigation of Physical and Biochemical Classification of the Coastal Estuaries in the Southeastern Pacific to be Applied on Integrated Management of Coastal Areas" was sent to Nominated Members, but was removed from further consideration because of comments received that the proposed activity did not fit well with the criteria for SCOR working groups. This proposal was felt to be too restricted geographically. Julie Hall noted that, since the proposal is similar to activities in which LOICZ specializes, SCOR has put the proponents in contact with the LOICZ International Project Office and follow-up should be made with the Inter-American Institute for Global Change Research (IAI). Bjorn Sundby noted that the decisions of which working groups to accept this year would be difficult, since the four

remaining proposals were of higher quality than in previous years. Three of the proposals overlap and, if approved, the groups will need to interact.

Duce asked reporters for the four proposals to synthesize the discussions prior to ranking. If IMAGES can truly support one-half of the two paleoceanographic proposals, then perhaps SCOR can support three new groups. Hein de Baar (The Netherlands) noted that the endorsement of SCOR may be even more important than the funding.

2.3.1 Working Group to plan and implement GEOTRACES, a collaborative multi-national program to investigate the global marine biogeochemical cycles of trace elements and their isotopes (see Annex 5)

GEOTRACES is a proposed project to determine the distributions of important trace elements and isotopes in the ocean, to understand ocean processes. Development of the project has been going on for several years among a small number of nations. The proposal to SCOR is to provide an international platform for this planning process. Robert Duce noted that this is an exciting activity that will help understand element cycles in the ocean, and thus ocean processes of several different types, and that it is more than a data-gathering exercise. Meeting participants discussed this proposal thoroughly. Most national committees that responded to this proposal in writing and at the meeting believed that the activity should be supported by SCOR, with some changes in the terms of reference (see below).

Wendy Broadgate (IGBP) noted that there has been strong community involvement in GEOTRACES development and that it has some of the same goals as IMBER. SCOR should encourage these linkages. Julie Hall asked whether approving the planning process would imply that SCOR approves the final project and the Executive Committee agreed that the project approval would be on the same basis as for other projects, an approved science plan. John Field asked that the activity involve scientists from developing countries. Miriam Kastner (USA) suggested that the activity should include a synthesis of what is known in the field of tracers; such information may be needed to develop a project later. The literature is diffused and many users would welcome a synthesis. Other discussion highlighted the importance of careful consideration of approving new projects in the context of existing projects and how GEOTRACES would fit into the set of such projects. Ed Urban noted that funding is likely to be available for GEOTRACES planning.

The Executive Committee decided to approve this group as a planning activity, as suggested by Peter Burkill representing the UK SCOR Committee, since it is relevant to SCOR's interests. However, (1) its terms of reference do not fit those of a typical SCOR working group, (2) the group's short-term goal is not aimed at answering a specific scientific question, and (3) the planning is already relatively advanced. Duce clarified that the distinction between a working group and a planning group is that the latter is more broadly based, designed to plan a future project, develop a Science Plan, and/or organize an Open Science Meeting. In response to input from National Committees and to points raised in a detailed discussion among the meeting participants,

SCOR requested that

- The Terms of Reference and the scientific questions being asked need to be strengthened and focused significantly.
- It needs to be made very clear that this is not simply a data gathering effort but would be a fundamental process-oriented program addressing critical marine biogeochemical issues and problems. In addition, the envisioned role of physical oceanography in the program and the benefits the program might have for a further understanding of climate and other global change issues should be articulated.
- Macronutrients appear to be under-represented in the planning document as it now stands, and this issue should be addressed.
- As part of their Terms of Reference, the group might consider a synthesis of the literature on this general topic as a useful prelude to the development of a detailed research plan and implementation strategy.
- A careful analysis of the required instrumentation for a successful GEOTRACES program should be part of the planning activity, with consideration given to necessary instrument development.
- When membership of the Planning Group is considered, it must include liaisons with IMBER and SOLAS as well as IMAGES/PAGES, and close interactions should take place with the two new proposed paleoceanography working groups, if they are approved. In particular, the proponents might consider where IMBER and GEOTRACES can jointly address issues, or even whether GEOTRACES should be part of IMBER.
- Proposed membership on the Planning Group must show a good balance in scientific expertise, gender, geography, and developing versus developed country individuals.

2.3.2 SCOR/IMAGES Working Group to Investigate the Reconstruction of Past Ocean Circulation (see Annex 6)

Andrei Zatsepin presented the proposal. He reported that the responses from SCOR national committees and others were positive, and this proposal was highly ranked among the five proposals reviewed. Zatsepin reviewed the rationale and tasks for the working group. IMAGES has agreed to cosponsor this group and has committed funding for its first meeting. The proposal is timely for SCOR and IMAGES and most of the suggested members are well known.

Meeting participants believed that the terms of reference need to state more explicitly that the group will address issues of rapid climate change and give this a higher priority than other kinds of climate change. There are two modelers in the proposed group, but modeling is not given enough emphasis in the proposal. Robert Duce noted that the first two terms of reference were typical for a SCOR working group, but the third would be more typical of a planning group. John Field noted that this issue could be addressed by reorganizing the products to put them in a logical chronological order and that the term of reference and product related to developing a plan should be downscaled to recommendations for future work. It is not clear how such a plan would differ from work already included in IMAGES, and why such a working group wasn't sponsored entirely by IMAGES. Urban noted that there is a connection, at least in sponsorship, with IMAGES. Gordon McBean noted that this is a proposal for another new project. Miriam

Kastner and Ilana Wainer (Brazil) suggested that the Southern Ocean should receive more emphasis in the project.

The Executive Committee agree to co-fund this group (with IMAGES), providing that the (1) terms of reference are changed, as proposed below, and (2) the products are re-ordered to reflect the terms of reference. These changes reflect the belief of the Executive Committee that it would be difficult for such a working group to create an implementation plan within the normal budget and timing of a SCOR working group. The synthesis and analysis activities given in the first and second terms of reference reflect typical activities of SCOR working groups. The group should finish its work by developing recommendations about future approaches in this field, based on completed terms of reference #1 and #2. Such recommendations could be designed to provide background for and support the development of science and implementation plans for the PACE project, which might start through a separate funding mechanism while this working group is active.

The proposed working group membership looks good, although the group should consider moving one Full Member (such as from the United States) to Associate Member status, and adding one more Full Member from a developing country or the Former Soviet Union/Eastern Europe. Peter Burkill noted that physical sedimentology is an important topic that seems to be missing. Michael MacCracken (USA) noted that proxy data for ocean circulation cannot be understood without reference to land, atmosphere, and ice processes, although this may only require that the working group interact closely with PAGES. Other participants noted that the results of the working group could be important for understanding biological changes and that geodetic and sea-level changes are also important considerations.

SCOR also approved a working group on Analysis of Links Between Present Oceanic Processes and Paleo-Records (see next section), also co-sponsored with IMAGES, and a planning group for GEOTRACES. Each of these groups differs in its scope and membership, but SCOR would like to see all three interact in some way, since their areas of focus overlap to some extent. Each has been asked to modify their tasks and/or membership somewhat, but the proposals show their scope accurately.

Proposed Revised Terms of Reference

- *Assess the existing paleoceanographic methods for reconstructing the history of ocean circulation over the past 120,000 years. Are the existing methods sufficient for a robust reconstruction of past ocean circulation? Are existing chronological tools sufficient to reconstruct distinct ocean circulation states? If not, what developments are necessary?*
- *Assess the available paleoceanographic data for reconstructing the history of ocean circulation over the past 120,000 years. Can robust conclusions on past ocean circulation be drawn from existing data? For what time periods and locations?*
- *Develop recommendations for future approaches to quantitatively assess the hypothesised changes in ocean circulation over the same time scale. Identify a minimum array of global locations and data types that would help to constrain uncertainties*

concerning changes in ocean circulation linked to major climate changes, bearing in mind the potential for collecting appropriate geological material as well as the size of the expected circulation signal relative to uncertainties in the methods. Through international co-operation with IMAGES and ODP, existing cores would be identified and plans for new coring to meet these objectives would be discussed.

Proposed Products

1. A set of synthesis papers in a specialised journal, resulting from the presentations and discussions of the workshop.
2. A report to *EOS*, the newsletter of the American Geophysical Union, documenting the findings and recommendations of the workshop.
3. A set of downloadable overheads (pdf) for the IMAGES/PAGES Web site summarising the findings and recommendations of the working group.
4. The final product of the working group would be recommendations for future work and for a possible future research program.

2.3.3 Working Group on Analyzing the Links Between Present Oceanic Processes and Paleo-Records (see Annex 7)

Ilana Wainer reported that the overall reaction to this working group proposal was very positive, with the feeling that the topic is important scientifically and timely. It was also expressed that the proposal is well structured, but somewhat broad in scope. Specific comments/suggestions are listed below:

1. Include in the text the expected products from the working group (e.g., books, papers in special volumes, Web page, etc.)
2. Restructure the text to move the terms of reference earlier
3. The membership is acceptable, although the membership (including the chairs) needs to be reduced to 10 members. This should be done without reducing the number of developing country scientists listed as full members, because they will be less likely to attend meetings if their expenses to the meetings are not reimbursed. It would be good to add someone active in SOLAS.

SCOR approved this group for co-funding with IMAGES.

2.3.4 Working Group on the Physical and Biological Structure of Meso-scale Rings in the World's Oceans

John Field, the Executive Committee Monitor for this proposal, reported that he had been in contact with the proponents of this proposal encouraging them to make revisions to it. Specifically, the terms of reference would need to be tightened and the composition of the proposed group made more balanced. The revised proposal had not been received at the time of the discussion. The working group was to look at the physical and biological aspects of mesoscale rings in the world ocean and to produce a synthesis book on this topic, according to an outline included in the proposal.

Not all meeting participants were sure that this topic is urgent and novel enough for a SCOR working group. One interesting suggestion was to add chemistry to look at how biogeochemistry differs inside and outside of rings. The general consensus of meeting participants and decision of the Executive Committee was to not approve the working group this year, but to allow re-submission next year.

Duce thanked everyone for all the input. The discussions were very productive and interesting, just as it should be in a SCOR meeting. Ed Urban commented on the process used this year. He noted that having two rounds of reviews really didn't work well. The call will go out early in 2004 (as it did in 2003), but allow just one round of discussion by national committees, giving a longer time for the national committees to review proposals. It would be helpful if more national committees submit their comments to reporters in writing before the meeting. As usual, we didn't get many comments from developing countries on proposals or members, and Urban noted that he would like to improve that situation.

3.0 LARGE-SCALE OCEAN RESEARCH PROJECTS

3.1 SCOR/IGBP Joint Global Ocean Flux Study (JGOFS) (see Annex 8)

The full JGOFS SSC met for the final time in conjunction with the final JGOFS Open Science Meeting in Washington, D.C. in May 2003. The SSC's Executive Committee will meet in Bergen, Norway. The JGOFS IPO staff members are making plans for closing the IPO. John Field, the Executive Committee Reporter, noted that this is the first major SCOR program to end in several decades. JGOFS is leaving a legacy of new knowledge and new programs, such as SOLAS and IMBER. Field introduced JGOFS SSC Member Toshiro Saino (Japan) to present the final JGOFS report to SCOR. Saino presented the accomplishments of JGOFS, as well as showing the JGOFS participants from its beginning. Saino invited Elizabeth Gross to add historical remarks about JGOFS beginnings. Wendy Broadgate thanked Saino and stated that JGOFS has demonstrated how to complete a project successfully. K.K Liu said that he appreciated the openness of JGOFS to include continental margin studies in a project that had previously been focused on open-ocean research. Peter Burkill added that JGOFS has involved a fantastic set of people, who worked hard and played hard, and had fun at all times! This is a superb time to be handing the baton of ocean biogeochemistry to IMBER. Gordon McBean thanked JGOFS from ICSU, noting the connections of JGOFS with WOCE. A successful program knows when it's time to move on. Huasheng Hong (China-Beijing) stated that JGOFS spurred international and regional cooperation for the Chinese community. Field added his congratulations to JGOFS and asked that SCOR write a letter of appreciation to the JGOFS Chair, SSC members, and IPO for the superb final report. A draft resolution from the Executive Committee was presented by Ed Urban. Meeting participants agreed with the resolution, with added congratulations to JGOFS for an excellent final open science meeting, as suggested by Hein de Baar (see Annex 9).

3.2 SCOR/IGBP/IOC Global Ocean Ecosystems Dynamics (GLOBEC) Project (Annex 10)

GLOBEC held its 2nd Open Science Meeting in Qingdao, China in October 2002. The GLOBEC SSC and many its subgroups met in conjunction with the Open Science Meeting, which was a well-attended and successful event. SCOR arranged extra support of the meeting from the U.S. National Oceanic and Atmospheric Administration (\$25,000 for the report publication and \$10,000 funding for U.S. scientists to attend) and the National Science Foundation (\$25,000 for general expenses). The 2003 GLOBEC SSC meeting was held in Banff, Canada in conjunction with the IGBP Congress. GLOBEC has helped raise SCOR's visibility by publishing an article about SCOR in its newsletter. Manuel Barange has established an annual research highlights document that will be posted on the SCOR Web site and could be a model for other projects to follow. Akira Taniguchi (Japan), the Executive Committee Reporter for GLOBEC, reported that he has been impressed with GLOBEC activities and its productive cooperation with ICES and PICES. GLOBEC research is crucial for providing information about the role of natural variability and climate effects on fish populations, which might add to human effects on these populations. It is important to understand the effects of regime shifts on fish populations and on the connections between phytoplankton, zooplankton, and fish.

Manuel Barange, the Executive Officer of the GLOBEC IPO, made a presentation about GLOBEC's recent activities and future plans. The Second GLOBEC Open Science Meeting was a review of the first phase of GLOBEC research. The project is at the threshold of its integration and synthesis phase. The GLOBEC Web site continues to develop, with PowerPoint slides and publications downloadable from it. Expected 2003 income for GLOBEC is about US\$415,000, coming closer to the level of US\$500,000 recommended by the International Group of Funding Agencies (IGFA) for Global Change Science. Barange thanked SCOR for its support. Ed Urban noted the success of GLOBEC's Second Open Science Meeting and GLOBEC-PICES-ICES Zooplankton Production Symposium in Gijón, Spain. Robert Duce thanked GLOBEC for its help with the development of IMBER. Michael MacCracken asked Barange what effect the changes in Arctic Ocean ice cover would have on the marine ecosystem there in the future. Barange responded that it would be hard to know what would be the effects of earlier annual ice retreat, but that the Ecosystem Studies of Sub-Arctic Seas (ESSAS) activity is designed to help understand and predict these effects. Peter Burkill asked why GLOBEC chose 2009 for its completion and what will happen between now and then. Barange responded that the GLOBEC Implementation Plan stipulated a 2009 completion (10 years from the approval of the Implementation Plan) and that GLOBEC and IMBER have worked hard to figure out how they will cooperate between now and 2009. GLOBEC will be (1) synthesizing and integrating and (2) setting up joint GLOBEC-IMBER activities. Robert Duce clarified that IGBP would like to have a single ocean project in 2009. K.K. Liu thanked Barange for his excellent presentation and asked if there are any Taiwanese scientists involved in CLimate Impacts on Oceanic TOP Predators (CLIOTOP). Barange replied that CLIOTOP is being developed from the bottom up by tuna scientists. There will be an open science meeting in November that will help broaden the participation.

3.3 SCOR/IOC Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) Program (see Annex 11)

The GEOHAB SSC met in France in November 2002 to work on the *GEOHAB Implementation Plan* and an editorial group met in early 2003 to finish the plan for review. Two new SSC members were appointed in 2003: Robin Raine (Ireland) and Ken Furuya (Japan). The Executive Committee approved a plan to rotate most of the remaining original members off the SSC at the end of 2003, with the leaders of the Core Research Project planning committees remaining on the SSC until the end of 2004. Grant Pitcher (South Africa) was approved to chair the SSC in 2004-2005 and Marcel Babin was approved to continue on the SSC for a second three-year term (2004-2006). IOC also agreed to these changes. Julie Hall, the Executive Committee Reporter for GEOHAB, reported that the reviewers' comments on the *GEOHAB Implementation Plan* were generally positive. Hall recommended that the plan be approved by SCOR if the changes suggested by GEOHAB in response to reviewers' comments are included in the final draft. One area of concern that remains is the issue of data management for the project, which Hall acknowledged will not be solved in the short term. GEOHAB will participate with other projects in a meeting on project data management issues in December 2003 and the output from this meeting should help GEOHAB and other projects with their data management needs. Hall also reported that GEOHAB would be holding their first focused open science meeting in Lisbon, Portugal in November 2003. GEOHAB still needs an IPO and Hall acknowledged the work of Henrik Enevoldsen (IOC) and Ed Urban in their temporary role as the GEOHAB IPO.

3.4 SCOR/IGBP/WCRP/CACGP Surface Ocean – Lower Atmosphere Study (SOLAS) (see Annex 12)

The SOLAS SSC met most recently in Banff, Canada in June 2003, in conjunction with the IGBP Congress. At the Banff meeting, they discussed the comments from the review of the *SOLAS Science Plan and Implementation Strategy* and formation of working groups to develop detailed research plans. SOLAS conducted a variety of implementation activities in 2003, including a very successful SOLAS Summer School. The SOLAS chair, Peter Liss (UK), obtained support for an international project office in the United Kingdom as part of a national SOLAS project. The Terms of Reference for SOLAS were revised in 2003 to acknowledge the Commission on Atmospheric Chemistry and Global Pollution (CACGP) as a full sponsor of the project (although not contributing financial support), as agreed by the four co-sponsors and the SCOR Reporter.

Robert Duce reported on behalf of Laurent Labeyrie, the Executive Committee Reporter for SOLAS, who was not able to attend the Moscow meeting. Duce reviewed the status of SOLAS planning. He reported that the SOLAS SSC's responses to reviewers' comments on the *SOLAS Science Plan and Implementation Strategy* should be available to SCOR in the next month. SOLAS will hold an open science meeting in Halifax, Nova Scotia, Canada in October 2004. Ed Urban discussed the review process and emphasized the need for SCOR to continue to work with other cosponsors on SOLAS and other projects to run a single review process with a common set of reviewers. K.K. Liu asked whether SOLAS will continue experiments on the effects of sea surface roughness on gas transfer, as done in the GASEX project. Duce responded

that the scientific leaders of GASEX have been taking part in SOLAS. The Executive Committee approved Wade McGillis (USA), Christiane Lancelot (Belgium), Osvaldo Ulloa (Chile), Shigenobu Takeda (Japan) and Gerrit de Leeuw (The Netherlands) as new SSC members, subject to approval by other co-sponsors, expanding the SSC by one member. A recommendation regarding approval of the *SOLAS Science Plan and Implementation Strategy* will be forwarded from Laurent Labeyrie to the Executive Committee for action within one month of the Executive Committee meeting.

3.5 SCOR/IGBP Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) Project (see Annex 13)

John Field, the Executive Committee reporter for IMBER, introduced Julie Hall, the chair of the IMBER Transition Team, to make her presentation. Hall noted that the IMBER Transition Team (and subgroups of it) met in Potomac, Maryland, USA; Paris, France; and Banff, Canada since the 2002 SCOR General Meeting. The Transition Team convened a well-attended Open Science Conference in Paris in January 2003. Since that time, the team has focused on developing the scientific focus of the proposed project and its interactions with related projects. SCOR and IGBP agreed to change the project's name from OCEANS to Integrated Marine Biogeochemistry and Ecosystem Research (IMBER). The draft *IMBER Science Plan/Implementation Strategy* will be completed in October 2003 and placed on the Web to solicit comments from the global ocean science community. These comments will be used to revise the draft, which will be sent to formal review by SCOR and IGBP around the beginning of 2004. Hall also described the new IMBER theme on human dimension issues, which will be a challenge for the project.

Robert Duce stated that the project development has moved along very well under Julie Hall's leadership of the Transition Team and noted that the co-sponsors had just approved her to chair the new IMBER SSC. Duce thanked IOC for hosting the OCEANS Open Science Meeting in January. Gordon McBean asked three questions:

1. Could SSCs of SOLAS and IMBER commonly approve joint projects? Hall responded that IMBER and SOLAS are setting up a transparent system for approval of activities that contribute to both projects.
2. Has IHDP been involved in development of IMBER? Hall responded that three social scientists, some suggested by IHDP, participated in the OSM and two of them continue to work with IMBER.
3. Is there a process for an ethics-type review of "large-scale manipulative experiments" (e.g., iron fertilization)? Hall responded that "large-scale" typically means tens of kilometers. Julie Hall reported that the SOIREE experiment had to seek approval through the New Zealand government and do an Environmental Impact Assessment for the cruise. Hein de Baar stated that these iron enrichment experiments only interest the press because of their relation to ocean fertilization.

Duce noted that three of the IMBER issues overlap with SOLAS and asked whether SOLAS scientists have been involved in developing IMBER. (William Miller is a member of both SSCs.) Hall responded that when one looks at the details of these topics, below the question level, there is not as much scientific overlap as it seems. Where needed, links with SOLAS are already being put in place. Urban thanked Peter Burkill for the “Ocean Futures” document that his committee produced, which served as the background document for the OCEANS OSM. SCOR and IGBP have agreed that their new projects, SOLAS and IMBER, should produce implementation strategy documents, rather than Implementation Plans, which might introduce the need for additional, detailed research planning.

Catherine Jeandel asked if there are any plans to deal with links to paleoceanography. Hall responded that the relevant text in the draft science plan is being reviewed by Keith Alverson (PAGES). The IMBER Transition Team decided not to separate the paleoceanography issues into its own section, but to integrate them throughout the science plan. Michael MacCracken asked about IMBER’s definition of continental margins. Hall responded that this will depend partially on the outcome of discussions with LOICZ (see next item), which includes drainage basins and estuaries to the continental shelf. IMBER-LOICZ links at the margins are still to be defined, but IMBER will probably leave estuaries and rivers to LOICZ. The key is that there should be no gap between LOICZ and IMBER in terms of process studies, as there was between JGOFS and LOICZ. Dennis Hansell (USA) and Patrick Monfray (France) were approved as IMBER Vice-Chairs.

3.6 Land Interactions in the Coastal Zone (LOICZ) Project

Julie Hall, the Executive Committee Reporter for LOICZ, reported that LOICZ project scientists were currently writing the Science Plan for the second phase of LOICZ. LOICZ asked SCOR to become a cosponsor. The 2002 SCOR General Meeting agreed, in principle, to co-sponsor the elements of LOICZ related to coastal ocean science, pending development of financial support for LOICZ. SCOR would not be considered a full co-sponsor with IGBP, as is the case for other projects, but would be a co-sponsor particularly of LOICZ Theme 3 on “Fate and transformation of materials in coastal and shelf waters.” SCOR co-sponsorship depends on arranging external funds for LOICZ activities. Ed Urban met with the LOICZ SSC in Banff at the IGBP Congress to convey SCOR’s decision and to hear about LOICZ plans. To address its five themes, LOICZ developed key questions and will look to individuals to take each one forward, with the LOICZ SSC playing a synthetic role. There were extensive discussions in Banff as to how SCOR and LOICZ could relate, such as through close links to the continental margins part of IMBER, perhaps in part through a joint working group similar to the JGOFS/LOICZ Continental Margins Task Team. Meeting participants discussed the implications of SCOR’s 2002 decision to cosponsor only Theme 3 of LOICZ, rather than the entire project. The resulting consensus was that this decision reflected SCOR’s area of expertise and that it was inappropriate for SCOR to be involved in other areas of LOICZ that fall outside of the field of ocean science, such as river basin issues, human dimensions, etc. Hein de Baar noted that LOICZ has an emphasis on human dimensions and that SCOR involvement with LOICZ could increase SCOR activity on this topic.

Although NSF is not interested in funding LOICZ, NOAA and the U.S. Geological Survey might be potential funding sources. K.K. Liu noted another benefit to SCOR of links to LOICZ: some ocean modelers now using data on human populations, not just natural processes, for input to models of coastal inputs to ocean.

This discussion led into a broader discussion of the potential role of SCOR in human dimension research. Robert Duce raised the issue of whether and how SCOR should get more involved and develop expertise in the human dimensions of ocean science problems. Elizabeth Gross noted that, in relation to LOICZ Theme 4 on vulnerability of coastal systems and human safety, there have been SCOR working groups on coastal erosion, storm surges, and similar coastal hazard issues. Perhaps SCOR could contribute natural science expertise to Theme 4 of LOICZ. Wendy Broadgate stated that it is the right time for SCOR to take an interest in social science, since GLOBEC and other SCOR-sponsored projects have human-dimension components. Hein de Baar cautioned that trying to link social sciences and natural sciences is very difficult, as demonstrated by the experience in Holland, but there are some cases where it would be good to take a “pilot” approach, such as establishing a SCOR working group on a human dimensions topic that is likely to succeed. An example would be the issues of the ethics and socio-economics in relation to large-scale ocean manipulation experiments. Manuel Barange reported that GLOBEC has had some success in breaking the natural science-social science barrier. For example, the next IHDP meeting has a GLOBEC session. Barange noted a couple other examples of upcoming meetings with interfaces between GLOBEC and social sciences.

4.0 OCEAN CARBON AND OTHER ACTIVITIES

4.1 SCOR/IOC Advisory Panel on Ocean Carbon Dioxide

The panel was involved in 2003 in helping to plan a joint activity with the Global Carbon Project on coordinating ocean carbon observations, in a new activity called the International Ocean Carbon Coordination Project (IOCCP). A second meeting is scheduled on ocean carbon data formats, to be held in Japan in January 2004. Panel members will reach the end of their first three-year terms at the end of 2003. The 2002 General Meeting recommended that the Panel’s terms of reference be modified to broaden the Panel’s scope to all ocean carbon and to acknowledge the ending of JGOFS, and the development of SOLAS and IMBER. The Panel’s membership needs to be modified in relation to the new terms of reference. Ed Urban noted that Doug Wallace was the panel Chair and Maria Hood was the primary staff person.

Urban presented the terms of reference for IOCCP, as well as a list of its meetings and activities. The meeting in January 2003 focused on the issues of underway ship-based pCO₂ observations and repeat measurements along WOCE lines by CLIVAR. A CD and an article in EOS resulted from this activity.² A related issue has arisen about what to do in exclusive economic zones

² Sabine, C.L., and M. Hood. 2003. Ocean carbon scientists organize to achieve better coordination, cooperation. *EOS* 84:218.

(EEZs). Presently, vessels must turn off their instruments when they enter a country's EEZ. Patricio Bernal is to raise this issue at a Law of the Sea meeting. Hein de Baar presented an update on European initiative (CarboEurope) and the agreement with NSF regarding collaboration with U.S. scientists.

4.2 SCOR/IOC Symposium on The Ocean in a High-CO₂ World

The committee for this activity met in Irvine, California, USA, in February 2003 to develop the agenda for the symposium. The symposium was originally to be focused on ocean carbon sequestration, but the committee decided that the scientific issues related to sequestration could best be examined in the context of the changes in the ocean that would occur under projected IPCC scenarios of atmospheric carbon dioxide, without any attempts at purposeful sequestration. The agenda for the symposium was presented at the Executive Committee meeting. The symposium will be held in Paris in May 2004, supported by NSF and the Research Council of Norway. The products of the activity will be a special section in *JGR-Oceans*, plus a short report with recommendations of priority research. Ralph Circerone (USA) is chairing the planning committee for this activity.

Robert Duce, the Executive Committee Reporter for the activity, asked if the symposium should include more on human dimensions, other schemes like fertilization of the ocean (not just carbon sequestration), Kyoto protocols, carbon credits, other policy issues, for example. But, the committee decided to stick more closely to science issues. Because the other issues were felt to be important too, Duce wrote to Patricio Bernal to see if IOC would sponsor a follow-up activity on some of them. There had been no response yet. Gordon McBean suggested involving policy people before the science meeting so that you know what kind of questions they are likely to pose. Miriam Kastner (USA) and Michael MacCracken discussed the importance of methane in the future. Urban responded that it would probably be a good idea to add a methane person to the new Advisory Panel on Ocean Carbon. Hein de Baar urged that some discussion of ethics be included in the symposium to show that SCOR is concerned about this issue. Duce responded to the points raised by McBean and de Baar that the planning committee had agreed to keep the focus strictly on science.

4.3 Other Activities

4.3.1 Basin-Scale Modeling

At the request of IOC, SCOR and IOC are co-sponsoring an activity in 2003 to bring together experts to examine how existing models can be scaled up to basin scales. The outcome of the activity is an article in *Science*.³ Scientists from GLOBEC, JGOFS, IMBER, and PICES are

³ deYoung, B., M. Heath, F. Werner, F. Chai, B. Megrey, and P. Monfray. 2004. Challenges of modeling ocean basin ecosystems. *Science* 304:1463-1466.

involved. This activity originated from the GLOBEC Focus 3 Working Group on Prediction and Modeling and will contribute to this group's work.

4.3.2 The Global Iron Cycle

SCOR was a supporting applicant for a proposal from IGBP to ICSU for an IGBP "fast-track initiative" on the global iron cycle, which will bring together experts on oceanic, atmospheric, and terrestrial aspects of the global iron cycle to create a synthesis paper for *Science* or *Nature*. Robert Duce and Peter Liss wrote the proposal and ICSU awarded \$40,000 to IGBP for this activity. Duce noted that the idea is to bring together scientists with knowledge of desert sources (processes, etc), atmospheric transformations, and the marine sinks (water column chemical and other processes and biological uptake and transformations). Hein de Baar added that the largest input of iron in the ocean is from the hydrothermal vents. Most of this iron is trapped in the metalliferous structures around the vents. Kastner added that upwelling from depth is also a very important source of iron. Although the source of upwelled iron is not completely known, it is likely to come from shallower seeps, which now appear to be very widespread. Rainwater is another source of iron in forms that are rapidly available to organisms. The meeting agreed that SCOR should ensure that these points are taken into account by the group of experts.

4.3.3 SCOR/IGBP Activity on Data Management for International Marine Research Projects

Ed Urban began a report on a planned meeting on project data management by stating that in the development of new projects, it is important that they have good, compatible data management plans in place very early. In the most recent SCOR proposal to NSF, Urban included a request for funds for a small workshop to bring project representatives (e.g., JGOFS, GLOBEC, IMBER, GEOHAB, IMAGES, OBIS, CLIVAR, IDOE) together to discuss data management, to follow up on a half-day session that was held at the IGBP Congress in Banff in June 2003. The meeting will be held in early December 2003 in Liverpool, UK. Roy Lowry of the British Oceanographic Data Centre will chair the meeting. Wendy Broadgate thanked SCOR for the effort and stated that IGBP was very interested in it.

5.0 CAPACITY-BUILDING ACTIVITIES

5.1 Regional Graduate Schools of Oceanography and Marine Environmental Sciences

The Executive Committee formed a small committee at the 2002 General Meeting to determine how to proceed with this activity, co-chaired by John Field and Ilana Wainer, and also including Huasheng Hong and Manuwadi Hungspreugs (Thailand). The committee presented their report. The database of foundations was given to Johann Lutjeharms (South Africa) and José Stuardo (Chile) for specific purposes, with the instructions that they are required to inform the SCOR Secretariat if they make any contacts based on the database information. Field reported that the sub-group had not made much progress yet, but a few of them discussed the activity while at the Executive Committee meeting. They want to see the idea taken forward and suggest a policy of regional graduate schools that are partnerships among graduate schools in Latin America, Africa

and southeast Asia. Field, Wainer, and Hong agreed to try to take this approach forward. In South America, this would mean a link to the existing program in Concepción, but an expansion of it. There is an existing partnership in southern Africa, without any marine content. However, the University of Cape Town has a large marine science initiative and Field hopes to link the two. Hong reported on a system of summer schools in Asia that could be linked somehow. Any effort under SCOR will need funding. What the planning group has in mind are short courses in relevant topics similar to those currently sponsored by the University of Concepción, the International Ocean-Colour Coordinating Group (IOCCG), and others. Such an activity should propose links to IOC/UNESCO, the Partnership for Observations of the Global Ocean (POGO), and other relevant organizations. But, this must involve regional partnerships in order to avoid rivalries. It will be necessary to develop networks in each region in order to successfully develop such a program. Each of these regions has a Large Marine Ecosystem (LME) activity, funded by the Global Environment Facility (GEF). Perhaps the centers could link to this structure. Umit Unluata reported that the marine education activity by IOC will be re-structured after Ehrlich Desa's appointment and urged strongly that Desa be involved in the SCOR activity. Terms of reference need to be developed for this activity.

5.2 POGO-IOC-SCOR Visiting Fellowships for Oceanographic Observations

Three rounds of fellowships have been awarded (13 each in 2001 and 2002, and 7 in 2003). This program was contributed by POGO as an activity to respond to the World Summit on Sustainable Development. Ed Urban reported that SCOR contributed \$8,000 to fund 3 specific fellows in 2003. POGO has made a request for continuing support in 2004. This seems to be an effective program. The program description was changed in 2003 to encourage south-south interactions (e.g., a Peruvian fellow went to Brazil). Manuel Barange asked for the full list of all 2003 fellows, and meeting participants agreed that this should be made available in the future.

5.3 NSF Travel Support for Developing Country Scientists

SCOR is in the second year of a three-year grant from NSF for these awards, at a level of \$75,000 per year. The Executive Committee, working by correspondence, had approved support for the following meetings since the 2002 General Meeting: 7th International Congress on the History of Oceanography, a workshop on HABs at PICES XIIth Annual Meeting, POGO-IOC-SCOR Fellowships, Land Use and Coastal Zones (LOICZ) Meeting, and for the symposium on Russian Ocean Sciences at the current SCOR Executive Committee meeting.

Urban reported that new requests had arrived and at the meeting the Executive Committee approved requests for the

- GEOHAB Open Science Meetings on (1) Upwelling, and (2) Fjords and Coastal Embayments;
- the IGBP/SCOR Workshop on The Global Iron Connection;

- GLOBEC SPACC meetings on (1) spawning habitat quality and dynamics and the daily egg production method, and (2) the economics of small pelagics and climate change;
- the annual symposium of the Committee on Space Research (COSPAR);
- the SCOR/IOC (WG 119) Symposium on Quantitative Ecosystem Indicators for Fisheries Management;
- the CLIVAR Open Science Conference;
- a meeting of SCOR WG 115 on Standards for the Survey and Analysis of Plankton;
- the SCOR/IOC Symposium on The Ocean in a High-CO₂ World;
- SOLAS Science 2004;
- a CoML Marine Biodiversity meeting;
- the IAPSO/SCOR Workshop on Forecasting;
- HAB XI; and
- POGO-IOC SCOR Fellowships.

Manuel Barange thanked SCOR for its support to GLOBEC-SPACC meetings. Gordon McBean queried whether SCOR has links to IAI or START. There was some discussion of these connections and it was agreed that there should be discussions of links of IAI and START at the SCOR level, rather than at project level.

6.0 RELATIONS WITH INTERGOVERNMENTAL ORGANIZATIONS

6.1 Intergovernmental Oceanographic Commission

Robert Duce and Ed Urban attended the IOC Assembly in June 2003 to represent SCOR. They made a few interventions and Duce made a presentation to the Assembly regarding SCOR activities of relevance to IOC. The SCOR brochure was available at the meeting in English, Spanish, and French.

6.1.1 Coastal Ocean Advanced Science and Technology Studies (COASTS) Meeting

The COASTS meeting was held in 2001, with SCOR cosponsorship and support. Umit Unluata reported that two volumes of *The Sea* arising from this meeting will be published in 2004.

6.1.2 IOC Policy on Access to Oceanographic Data

The IOC Assembly discussed a draft policy and approved a revised version.

Clause 1—Member States shall provide timely, free and unrestricted access to all data, associated metadata and products generated under the auspices of IOC programmes.

Clause 4—With the objective of encouraging the participation of national and private marine data-gathering bodies in international oceanographic data exchange and maximizing the contribution of oceanographic data from all sources, this policy

acknowledges the right of Member States and data originators to determine the terms of such exchange, in a manner consistent with international conventions, where applicable.

Robert Duce made an intervention on behalf of SCOR and ICSU regarding the changes, particularly the changes to Clause 4, which could be considered to negate Clause 1 and thus weaken the overall policy. However, the intervention was not accepted. Manuel Barange noted the sensitive nature of some GLOBEC fisheries data, which cannot legally be shared.

6.2 Other Intergovernmental Organizations

6.2.1 Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)

Robert Duce, the past-president of GESAMP, noted that GESAMP is 30 years old and recently underwent a significant review, for which SCOR provided two of the four reviewers. Duce was Chair of GESAMP at that time. Fundamental changes were proposed and the review report is now being considered by the sponsors of GESAMP. A new strategic plan was developed by a consultant. GESAMP is in a stage of transition.

6.2.2 International Council for the Exploration of the Sea (ICES)

ICES provided comments regarding the 2003 working group proposals, but no formal written report for the Executive Committee meeting. ICES co-sponsors one of GLOBEC's regional activities, the Cod and Climate Change project.

6.2.3 North Pacific Marine Science Organization (PICES)

SCOR and PICES have cooperated in several activities in the past year, as described in the PICES report, which was presented at the meeting by Vladimir Radchenko.

PICES is an intergovernmental scientific organization established in 1992. Its current membership includes Canada, Japan, China-Beijing, Korea, the Russian Federation, and the United States. PICES has many scientific interests coinciding with interests of SCOR, and PICES scientists have been important contributors to certain SCOR activities. Radchenko stated that continuing and extending cooperation with SCOR is important for PICES to advance its scientific agenda. Conversely, PICES could offer a regional perspective to global activities of SCOR.

PICES contributed to the following SCOR activities in 2002-2003:

GLOBEC—The PICES-GLOBEC Program on Climate Change and Carrying Capacity (CCCC Program) provides a mechanism for integrating national GLOBEC research programs in the North Pacific and is a regional component of the international GLOBEC effort. PICES and GLOBEC worked together (with ICES as another sponsor) to organize the 3rd Zooplankton Production Symposium on “*The role of zooplankton in global ecosystem dynamics*:

Comparative studies from the World Oceans“ that was held May 20-23, 2003, in Gijón, Spain (travel support was given to 16 scientists from 12 countries by the SCOR/NSF grant).

JGOFS—A collection of contributed papers from JGOFS-related field programs in the North Pacific was published as a special JGOFS/PICES issue of *Deep-Sea Research II on North Pacific Biogeochemical Processes*. Selected papers from the PICES/JGOFS Topic Session on “*Plankton size classes, functional groups and ecosystem dynamics: Causes and consequences*“ at PICES X comprise a special issue of *Progress in Oceanography*. A special issue of *Journal of Oceanography on Synthesis of JGOFS North Pacific Process Study* is in progress; publication is expected in spring 2004.

SOLAS—Understanding of the iron cycle and iron limitation in marine ecosystems is an important part in the agenda of both SOLAS and PICES, and PICES has been a leader in developing SOLAS-related iron enrichment studies in the North Pacific. The Canadian SOLAS and PICES proposed a jointly co-sponsored session on “*Response of the upper ocean to mesoscale iron enrichment*“ at the ASLO-TOS meeting to be held February 15-20, 2004, in Honolulu, USA.

GEOHAB—Activities and products of the PICES WG 15 on *Ecology of Harmful Algal Blooms in the North Pacific* are complementary to the efforts of the SCOR-IOC GEOHAB program. Greater communication and planning for joint activities between WG 15 and GEOHAB should be encouraged, especially considering sufficient overlap in membership for these two groups. PICES is prepared to discuss involvement in development/realization of the GEOHAB *Implementation Plan* by assisting with coordination of national efforts in the North Pacific.

IMBER—PICES is interested in the development of the IMBER project and sent several representatives to the OCEANS Open Science Meeting, held in January 2003, in Paris, France.

SCOR WG 115 on Standards for the Survey and Analysis of Plankton—By the request from SCOR, PICES recommended Dr. Song Sun (Institute of Oceanology, Chinese Academy of Sciences, People’s Republic of China) as a new member from the North Pacific region for this Working Group. Dr. Sun has the required expertise in conducting Continuous Plankton Recorder (CPR) surveys.

SCOR WG 119 on Quantitative Ecosystem Indicators for Fisheries Management—The overlapping scientific interests of PICES and the SCOR-IOC WG 119 resulted in PICES involvement in planning and organizing the International Symposium on *Quantitative Ecosystem Indicators for Fisheries Management* to be held March 31-April 3, 2003, in Paris, France. PICES is represented on the Scientific Steering and Organizing Committee for the Symposium, provides its Web site for on-line registration and abstract submission, and will develop the Symposium Book of Abstracts and send staff for organizing registration and sessions on site.

SCOR-IOC Advisory Panel on Ocean CO₂—The SCOR-IOC Advisory Panel on Ocean CO₂ emphasized the importance of international participation in the design of Ocean Carbon Observing System and recognized/adopted PICES as a regional coordination group for Pacific carbon work. Activities of the PICES WG 17 on *Biogeochemical Data Integration and Synthesis* (as well as its predecessor, PICES WG 13 on *CO₂ in the North Pacific*) are recognized by the Panel as essential for improving the overall quality of oceanic CO₂ measurements, resolving data synthesis issues and developing strong collaborations for the integration of the large CO₂ data set in the North Pacific. A *Guide of Best Practices for Oceanic CO₂ Measurements and Data Reporting* is under preparation. Publication in the *PICES Scientific*

Report Series is planned in mid-2004. The SCOR-IOC Advisory Panel and the International Ocean Carbon Coordination Project (IOCCP) agreed to co-sponsor this publication.

PICES requested SCOR to support scientists from developing countries and countries with economies-in-transition to attend SCOR-related topic sessions and workshops at the PICES Thirteenth Annual Meeting to be held October 15-23, 2004, in Honolulu, Hawaii, USA.

6.2.4 Other Intergovernmental Organizations

SCOR is involved with other intergovernmental organizations on an occasional basis. For example, FAO is providing funding for the SCOR/IOC Symposium on Quantitative Ecosystem Indicators for Fisheries Management.

7.0 RELATIONS WITH NON-GOVERNMENTAL ORGANIZATIONS

7.1 International Council for Science

No funds were requested by SCOR from ICSU in 2004 although, as mentioned earlier, SCOR did support a successful application from IGBP to ICSU, on the global iron cycle. Robert Duce made a presentation about SCOR to ICSU's Priority Area Assessment (PAA) on the Environment in Relation to Sustainable Development in February 2003. The SCOR Secretariat and Executive Committee have also responded to several other ICSU requests for information and nominations, and have participated in other ICSU activities in the past year.

The findings of the assessment were released in August 2003 and Gordon McBean, a member of the PAA committee, presented a summary of the PAA findings in relation to SCOR at the meeting. SCOR was reviewed in the group of Thematic Organizations and fared very well in relation to other ICSU organizations. McBean provided additional background information about the PAAs. About 2000, ICSU created its Committee on Scientific Planning and Review and this group is preparing a strategic plan for ICSU. ICSU bodies used to be reviewed in an uncoordinated way. In the group on Observing Programs, there were some comments related to GOOS and the need to better connect with the science programs. In reference to a matrix relating to inter-organization connections to one another, among unions IUGG showed the strongest relations to SCOR and IUPAC also mentioned SCOR. One recommendation of the PAA committee is that ICSU needs to develop some cohesiveness among its environmental programs. Robert Duce added that SCOR took this review very seriously and is delighted with the results. Duce read a few of the comments from the report (see Annex 14 for final comments about SCOR) and some participants asked for the section as soon as the report is available, to help in their efforts to continue payment of SCOR dues from their nations.

Ed Urban reminded the meeting of the approved ICSU project on Comet/Asteroid Impacts and Human Society. Laurent Labeyrie attended a planning meeting for this project on behalf of SCOR. Discussion followed about Labeyrie's desire to turn over responsibility for SCOR

representation to someone else on the Executive Committee who has looked at asteroid impacts and the ocean. Michael MacCracken volunteered.

7.1.1 International Geosphere-Biosphere Program (IGBP)

Robert Duce and Ed Urban attended the IGBP Science Committee meeting in Punta Arenas, Chile in January 2003 to represent SCOR. Duce made a presentation about SCOR and its activities. Julie Hall also attended at IGBP's expense as the OCEANS (now IMBER) Transition Team chair. All three were planning to attend the 2004 IGBP-SC meeting in Moscow, Russia. IGBP held its triennial Congress in Banff, Canada in June 2003 and Julie Hall, John Field, and Ed Urban attended. At this event, all project SSCs and project development teams met together to develop joint activities.

Wendy Broadgate made a presentation about the IGBP/SCOR Ocean Vision planning document. IGBP has nearly completed transition to its second phase, in which it is looking at science in a more connected way, in context of the overall Earth System. The Ocean Vision is meant to provide guidance for IGBP-sponsored ocean projects as they work toward integrated science. There are two main components: (1) the role of the ocean in Earth System and (2) predicting consequences of global change for the ocean as a tool to investigate pathways to sustainability. Broadgate reviewed the steps and means for implementing IGBP II and partnerships within the "Earth System Partnership" (IGBP, the World Climate Research Programme [WCRP], IHDP, and DIVERSITAS). She spoke about the Global Carbon Project, which is a framework to integrate ongoing carbon research efforts. The Global Carbon Project (GCP) includes IOCCP in its portfolio of activities.

Integration within IGBP and across the projects is very important and includes links between IGBP projects, ESSP joint projects, integrated regional studies, fast-track initiatives, a new ESSP project for Earth System modeling (AIMES), and joint IGBP-SC meetings with WCRP. Fast-track initiatives address a specific science question in a more integrated fashion than at the Core Project level, are established for a defined period (2-3 years), and produce a seminal paper, similar to a SCOR working group. Three fast-track initiatives were approved at the 2003 IGBP-SC meeting: (1) global iron connections (with SCOR), (2) global nitrogen cycle (with SCOPE), and (3) mercury and contaminants (with SCOPE).

IGBP is trying to rejuvenate its national committees. At the IGBP Congress in Banff in June 2003, IGBP arranged funding to bring national committees to the Congress to meet with project scientists and this was valuable. Other new mechanisms to involve national committees in IGBP work will include an "ambassadors network" of individuals describing IGBP activities to their governments. A survey of national committees revealed a few top priority agenda items, such as the need for an institutional network of Earth System science institutes and an African counterpart to IAI and the Asia Pacific Network for Global Change Research (APN). IGBP national committees will be asked for advice about development of integrated regional studies. Communication of the IGBP Secretariat with national committees will be strengthened, through such mechanisms as an e-mail chat room, and a meeting every two years. Broadgate noted that

Will Steffen's term as IGBP Executive Director will end in 2004 and a search has begun for a new person for this position. Ed Urban added that he has suggested to SCOR national committees to work more closely with IGBP national committees, since SCOR and IGBP co-sponsor several research projects.

7.1.2 Scientific Committee on Antarctic Research (SCAR)

SCAR and SCOR presidents developed a cooperative agreement in 2001, although not much progress has been made in implementing the agreement since then. SCAR formed an Action Group on Oceanography in 2001, and SCOR will send a representative to their next meeting. Julie Hall represented SCOR and IMBER at a meeting on Southern Ocean research sponsored by the British Antarctic Survey in July 2003. SCOR, SCAR, and IAPSO co-convened a session on Southern Ocean research at the IUGG meeting in Sapporo, Japan in June/July 2003. Plans are now being made for the next International Polar Year (IPY), which will take place in 2007, and SCOR may take part in that activity.

Robert Duce introduced Jörn Thiede, the SCAR President, to make a presentation about SCAR. SCAR's next meeting will be held in Bremen, Germany in July 2004, in conjunction with an Open Science Conference. SCAR has a different organization from SCOR because SCAR also provides international, independent scientific advice to the Antarctic Treaty system, much as SCOR is an advisor to IOC. SCAR's area of responsibility is south of 60°S. SCAR was founded after the International Geophysical Year (IGY), soon after SCOR, and has evolved into a set of small working groups. SCAR is now hiring a new Executive Director and is reorganizing. SCAR has fostered two committees that manage logistics and station operations in the Antarctic. SCAR was externally reviewed a few years ago and the recommendations are now being implemented.

SCAR science operates through four standing groups, and their science programs are to be adopted in Bremen in 2004. The present era is the only time in Earth history when there has been a bi-polar glaciation. The opening of the Southern Ocean is also a relatively recent event; the first ice-cover of Arctic Ocean also a "recent" event (10 million years before present). Polar environments can change very rapidly and it is hard for plants and animals to adapt to these extreme conditions. Thiede proposed the following topics that SCOR and SCAR could pursue together:

- Evolution of the Antarctic system
- History of the Antarctic Circumpolar Current
- Activities of the International Ocean Drilling Program in the Southern Ocean
- Stability of Antarctic ice cover, especially ice sheets (data are available from a new ESA satellite: CRYOSAT)
- Applications of data from new ice core (back to 1 million years before present)
- Sea level – linked to ice sheet questions
- Ecology of the Antarctic sea ice zone
- Diversity of Antarctic slope and deep sea faunas (may be higher than thought)

- Evolutionary biology of Antarctic organisms
- Impacts of fisheries on Antarctic ecosystems

Expeditions to Antarctica and the Southern Ocean require applications for research licenses. Research using acoustic methods are difficult to get approved with these procedures because of potential interference of research noise with marine mammals. A potential SCAR-SCOR topic could relate to developing new technology that minimizes these problems, that is to say, what we can do to minimize effects via instrument design. Duce responded that this issue is not unique to the Southern Ocean. Perhaps the two organizations (and others) could form a joint working group on this topic? It is important for ocean science, although it is a politically tough issue. Thiede referred to a recent report on the topic by the U.S. National Academy of Sciences. Reports are also available on a related SCAR workshop held in Cambridge, and another held in Germany.

SCAR is sponsoring a meeting on Southern Ocean in October 2003 in Rome, Italy. Ed Urban thanked SCAR for the invitation for SCOR to participate in the Rome meeting. (Roberto Purini attended this meeting on behalf of SCOR.)

Thiede briefly mentioned the International Polar Year III (2007-2008). Chris Rapley at the British Antarctic Survey is the lead person for ICSU on planning for IPY. There will be a call for proposals for work in that year. The planners have challenged the relevant research communities to come up with really original scientific ideas for this effort. Duce thanked Thiede for the presentation and for ideas on areas for future cooperation.

Annelies Pierrot-Bults suggested that marine biodiversity could be another area of cooperation, which could also link to existing efforts by other organizations. Gordon McBean welcomed the optimistic, forward-looking view of SCAR and the changes in its operation, and encouraged SCAR to make more contacts with other ICSU bodies like SCOR. Michael MacCracken asked if SCAR links to IPCC. The most recent IPCC assessment included projections that a build-up of the Antarctic ice sheet would contribute to sea level decrease. This conclusion was questioned in the science community and we need to get at the truth of this issue. This should be a priority question. Thiede responded that there are no good answers to questions relating to stability of Greenland or Antarctic ice sheets. Polar scientists are just now getting good information on the three-dimensional age structures of these ice sheets. MacCracken replied that we need a major effort to test the quality of the models. Julie Hall asked about the mechanisms from SCAR for interactions. Thiede responded that SCAR needs to establish new fund-raising efforts; SCAR member countries have many resources to contribute.

Continuing on Southern Ocean topics, Cynan Ellis-Evans made a presentation about the Climate Interactions, Resources and Carbon Links (CIRCLE) initiative (of the British Antarctic Survey, whose purpose is to establish the importance of the Southern Ocean to the Earth System. CIRCLE will focus on both global connections and circumpolar regional connections. It was initially a European initiative. Its flagship activities are located in the Antarctic and especially the Southern Ocean. The Southern Ocean is the one truly global ocean and profoundly influences

global systems. Over the past decade or two we have arrived at a basic understanding of the major Southern Ocean systems, but we are still not addressing variability. We need an understanding of Southern Ocean variability in order to understand and predict Earth System variability. In relation to large-scale climate processes, the Southern Ocean is strongly influenced by a broad range of processes and interactions with the atmosphere and sea ice. According to Paul Treguer, 40% of the total oceanic accumulation of anthropogenic CO₂ is located south of 35°S. CIRCLE wants to focus on Southern Ocean ecosystems and the dynamic processes in them, for example, what controls the large-scale krill distribution? Sea ice extent? Antarctic Circumpolar Current (ACC) fronts? There are important scientific issues related to remote spawning areas, water mass and sea ice variability. Another interesting question is what controls Scotia Sea phytoplankton distribution. The Southern Ocean has been one of the few areas in the world where an ecosystem approach has been taken to fisheries management, through the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). CIRCLE is also interested in impacts of global warming, on stratification, uptake of CO₂, interplay between physical and biological pumps, natural variability, sea ice, position and velocity of the ACC. CIRCLE has settled on three topic areas: (1) climate variability, (2) biogeochemistry, and (3) ecosystem dynamics and resources.

A SO CIRCLE steering committee has been formed, representing all European Antarctic operators. They are developing a broad program for IPY, within the framework of the EU Framework 6 program. They are now attempting to develop support for CIRCLE from outside Europe and from global projects with Southern Ocean components.

Ellis-Evans added additional comments to Thiede's earlier comments about IPY plans. The planning has been somewhat complicated by the coincidental plans for International Earth Year (50th anniversary of IGY) and the International Heliospherical Year. The original IGY led to many benefits, generated much new understanding, and led to the development of organizations such as SCOR, SCAR, WCRP, and others. The European Science Foundation's Polar Board and others approached ICSU about convening an ICSU IPY planning committee. The planning time is short; four years may not be enough in terms of planning for operations in polar regions. 2007-2008 may turn out to be a celebratory year, with some intensive studies and follow up for as much as a decade afterward. It will be a good opportunity to extend observing networks. The IPY planning committee will choose 5 or 6 big themes. The draft plan is due to ICSU in February 2004, the full proposal in May 2004, and final endorsement to be sought from ICSU in 2005. IPY activities must be of a scale that would not otherwise be possible, must be truly bipolar and include both summer and winter studies, must be multidisciplinary, truly international, push frontiers (but accept risk of failure), and be easily sold to public and funding agencies. Rapley's group is looking for ideas to be submitted by the end of 2003 and for comments on the three major themes.

Discussion about possible SCOR involvement in IPY followed. Ilana Wainer asked about the involvement of South American countries. Ellis-Evans responded that Rapley is working on this. Hein de Baar noted that many of these types of activities have already been well coordinated within marine projects, such as Southern Ocean JGOFS. Communities like the iron

fertilization community are already well organized. Perhaps CIRCLE could help link individual efforts already ongoing. Robert Duce responded that this is a critical aspect related to IPY. SCOR is already sponsoring several projects, such as GLOBEC, IMBER, and GEOTRACES, with Southern Ocean components. Developing interfaces among them is very important. Umit Unluata added that IOC wants to see further development of observing systems during IPY. For example, Argo floats cannot operate under ice. Technology development is needed. Michael MacCracken commented that to be successful in selling IPY, planners must realize that most people don't live in polar regions. IPY will need to be sold in terms of the importance of polar regions for things like food, impact on climate, and opening of Arctic transportation routes. Duce suggested that the SCOR liaisons to SCAR (Hall and Labeyrie) be the contacts for future SCOR involvement in IPY activities.

7.1.3 World Climate Research Program (WCRP)

WCRP is a partner with SCOR in the SOLAS project. No formal written report from WCRP was available for discussion at the Executive Committee meeting.

7.1.4 Scientific Committee on Problems of the Environment (SCOPE)

Annelies Pierrot-Bults attended the 47th SCOPE meeting in June 2003 to represent SCOR. She reported that SCOPE has been geared to terrestrial and near-coastal zones. SCOR became a member of SCOPE in 2003 in order to develop more linkages. At their next General Meeting, Pierrot-Bults will make a presentation about SCOR's activities. They are considering a monsoon-related project and didn't seem to know anything about SCOR/IMAGES WG 113 on Evolution of the Asian Monsoon in Marine Records: Comparison Between Indian and East Indian Subsystems. Ed Urban responded that the project that was discussed is being undertaken as part of the ESSP regional integrated studies and that he had given information to the START office (the coordinating body) about the working group. Pierrot-Bults thinks that SCOPE should be interested in SOLAS, IMBER, and other SCOR-sponsored large-scale marine research projects. However, SCOPE's mode of operation for their studies might make it difficult to have a joint working group. Jesse Ausubel encouraged SCOR to get involved in the proposed international nitrogen initiative that is being led by SCOPE. IAPSO and SCOPE may propose a joint activity on "an appraisal of our understanding and future research needs on the role of physical and chemical processes in the dynamics and structure of marine ecosystems" and have asked SCOR to be involved in the project, named Physics and Chemistry as the Key to Marine Ecosystem Dynamics and Structure (PACKMEDS). The Executive Committee decided that it would be important for SCOR to be involved.

7.2 Affiliated Organizations

7.2.1 International Association for Biological Oceanography (IABO)

Annelies Pierrot-Bults, the President of IABO, reported that IABO is organizing a 2nd joint meeting with IAPSO in August 2005, in Cairns, Australia. Three IABO symposia are planned. John Field congratulated Pierrot-Bults for bringing new life to IABO.

7.2.2 International Association for Meteorology and Atmospheric Sciences (IAMAS)

Michael MacCracken, IAMAS President, reported that IAMAS is one of seven associations making up the International Union of Geodesy and Geophysics (IUGG). Over 40 of the member nations of the IUGG participate in IAMAS. The scope of the scientific interests of IAMAS include all aspects of meteorology and atmospheric sciences, including the dynamics, thermodynamics, radiation, chemistry, and electrification of the Earth's and planetary atmospheres on time scales from fine-scale weather phenomena to long-term climatic behavior and from the surface up through at least the stratosphere. Because atmospheric behavior is so strongly affected by boundary influences, the interests of IAMAS naturally extend to atmospheric interactions with the oceans, land surface, cryosphere, biosphere, and solar radiation. The objectives of IAMAS are to promote the study of the science of the atmosphere; to initiate, facilitate, and coordinate international cooperation; to stimulate discussion, presentation and publication of scientific results; and to promote education and public awareness. These objectives are pursued primarily by providing the scientific community with opportunities to present, discuss and promote the newest achievements in the basic fields of research and in related areas. Rather than being an organization of individual members, the scientific meetings of IAMAS and its commissions are open to all scientists in the field. IAMAS is a major participant in the quadrennial general assemblies of the IUGG. In addition to these general assemblies, IAMAS organizes special assemblies in the mid-years between the IUGG assemblies. The 2005 special assembly will be held in Beijing from 2-11 August, with its tentative theme planned to be "The Fascinating Atmosphere: Changeable and Changing." This special assembly will be coordinated with the second PAGES Open Science Meeting "Paleoclimate, Environmental Sustainability and our Future," which will be held from 10-12 August at the same location. In order to help promote the international development of atmospheric sciences, IAMAS devotes the largest fraction of its limited resources to promoting opportunities for scientists from developing countries. One aspect of this effort is sponsoring the participation of developing nation scientists at IAMAS meetings. A second important element of this effort is the ALLIANCE project. The purpose of the ALLIANCE, which brings together the efforts of WMO, UCAR, and IUGG, is to stimulate intensive collaboration between of the National Meteorological and Hydrological Services, the university sector, and the scientific community. IAMAS also works with other organizations through liaisons and project leaders. Among the linkages are those with WMO, SCOR, and the IUGG GeoRisk and IGY+50 projects.

7.2.3 International Association for the Physical Sciences of the Oceans (IAPSO)

As mentioned earlier, a cooperative SCOR/SCAR/IAPSO session was convened on Southern Ocean research at the IUGG meeting in Sapporo, Japan in June/July 2003. Eileen Hofmann (USA) served as the SCOR convener for the session. The SCOR-IAPSO joint request of funds from the U.S. Office of Naval Research for WG 121 was not successful. IAPSO has requested to be a partner on WG 122, which was approved. Eugene Morozov, a member of the IAPSO Executive Committee, represented IAPSO at the Executive Committee meeting. Morozov added to the earlier report of Annelies Pierrot-Bults that the planned joint meeting in Cairns, Australia would also include the International Association for Geodesy. He presented ideas for cooperation with SCOR, include co-sponsorship of WG 122. Another is the request for SCOR

support for the International Workshop on Forecasting and Data Assimilation in the Benguela and Comparable Systems. Another initiative would be to create a small foundation for young scientists to participate in meetings. This might help keep young scientists in the field rather than turning to other areas of interest.

7.3 Affiliated Programs

The benefit of continued affiliation to SCOR is evaluated at each General Meeting. Reports are provided at Executive Committee meetings for information only. Affiliated programs are supposed to have a maximum affiliation with SCOR of 10 years. IMAGES will be first to reach 10 years, in 2005. The only requirements after affiliation are annual reporting and rotation of committee memberships.

7.3.1 Census of Marine Life (CoML)

Robert Duce introduced this topic by stating that the CoML program is now truly international and very exciting. He introduced Ron O'Dor, the CoML Senior Scientist. O'Dor reported that CoML's goal is to assess and explain the diversity, distribution and abundance of marine life. It has developed four "grand challenge" questions and programs to address these questions. The History of Marine Animal Populations project uses historic records of all kinds to derive information on past biological state of the ocean. The Ocean Biogeographic Information System (OBIS) assembles species-specific data for marine organisms. CoML conducts a variety of education and outreach efforts. The most significant upcoming one is the launch event in Washington, D.C. on October 23, followed by the CoML meeting on October 24 and 25. O'Dor described the CoML field projects, which are grouped into zones, for example, nearshore, coastal, abyssal plain, central ocean planktonic zone, and others. A series of implementation committees have been established, both at national and regional levels. CoML recognizes the "power" of SCOR in promoting understanding of the ocean via projects like JGOFS and GLOBEC. CoML is designed to interface with such project and with GOOS, to "complete the suite of ocean research programs with its focus on species and diversity." D. James Baker, the past GOOS Steering Committee Chair, is a member of the CoML SSC as a liaison with GOOS.

Robert Duce stated that SCOR is delighted with development of CoML. Manuel Barange reported that GLOBEC and CoML are very closely linked and working together. He asked what is the link of CoML to the Millennium Ecosystem Assessment (MA)? O'Dor responded that CoML is a resource that is making information available for the MA. Ausubel added that CoML aims to report in 2010 and expects that this will be the most comprehensive report ever on what is known about marine life. CoML is sharing its early results with the MA, which will probably focus on 200 or so commercially important species and a few other "charismatic" species (e.g., corals) that live in the ocean.

7.3.2 International Antarctic Zone (iAnZone) Program

IANZone was conceived in the early 1990s as a sequence of informal biennial meetings of Southern Ocean researchers, primarily physical oceanographers, who were interested in understanding the Southern Ocean and its role in climate change. Accorded status as a

SCOR Affiliated Program in early 1997, iAnZone's goal has been to advance our understanding of climate-relevant processes within that region of the Southern Ocean poleward of the Antarctic Circumpolar Current. IAnZone has (1) provided for exchange of ideas, plans, results and data; (2) identified, developed and coordinated research projects consistent with the latter goal; (3) facilitated coordination among Antarctic and global climate programs, and among other Southern Ocean programs; and (4) advised on the development of appropriate observing systems, data sets and modeling strategies needed to assess the scales and mechanisms of climate variability in the Antarctic Zone.

IAnZone has had a productive tenure under SCOR sponsorship. Planning was initiated for ANSLOPE (Antarctic Slope), an underway international study of the processes by which dense water exits across the Ross Sea continental shelf and slope to ventilate the global ocean. Planning continues for ISPOL-1 (Ice Station Polarstern), a drifting station scheduled to take place in the western Weddell Sea during austral spring-summer of 2004-2005. Planning has led to submission of a proposal to the U.S. National Science Foundation for support of a field study of small-scale processes in the Maud Rise region of the eastern Weddell Sea.

iAnZone planned to hold its final meeting in 2003 and end its affiliation with SCOR at that time. However, Ed Urban reported that iAnZone developed a link to CLIVAR and now want their affiliation to continue. Formal decisions on affiliation are handled at General Meetings, so iAnZone affiliation continued as originally planned.

7.3.3 PAGES International Marine Global Changes Study (IMAGES)

IMAGES was initiated to respond to the challenge of understanding the mechanisms and consequences of abrupt, natural climate changes at time scales of decades to millennia using oceanic sedimentary records. A fundamental goal of IMAGES remains to produce data sets to test models of climate variability and future climate change, to determine the sensitivity of the ocean and climate response to external and internal forcing and to constrain the role of the ocean in controlling atmospheric CO₂. IMAGES accomplishes these objectives through (1) the planning and coordination of oceanic cruises to retrieve and exploit (in international collaboration) giant sediment cores from long, continuous time series in high sedimentation rate areas of the ocean, and (2) the support of symposia, working groups, and their workshops. This is the seventh year of the IMAGES program. 26 countries and universities consortia are members and 23 of them contribute to the IMAGES budget. The IMAGES Office is located at the University of Kiel, Germany until end of 2003, after which it will move for a period of four years to the University of Bremen. Ralph Schneider will become Executive Director of IMAGES. IMAGES has supported the activity of several IMAGES and SCOR-IMAGES working groups. There are currently six active IMAGES working groups, whose main task is to coordinate the acquisition of cores and laboratory data in key areas. Over the last eight years, the IMAGES program has organized ten international cruises, and a new coring cruise on board the French research vessel *Marion Dufresne* is taking place from May to June 2003. The main IMAGES activity in 2002 focused on the two-month MONA and PAGE

Cruises on board *Marion Dufresne*, from Vancouver (Canada) to Panama and from Panama to Belem (Brazil). In the next three years, IMAGES plans a series of cruises to retrieve cores from key areas such as the Southern Ocean, which remains the least understood region on Earth in terms of past involvement in climate change at suborbital time scales.

7.3.4 InterRidge - International, Interdisciplinary Ridge Studies

InterRidge was created in 1992 with the objective of supporting and developing programs that are of major scientific interest, interdisciplinary, globally or thematically defined and, most importantly, require or will benefit from international discussion, planning, and implementation. The original science plan for InterRidge was created for a period of 10 years. Thus, the InterRidge program will come to the end of its first science plan at the end of 2003. The InterRidge steering committee unanimously voted that the program should continue to exist and that a new science plan should be drafted for the second decade of InterRidge.

The first 10 years of activity have produced a united, coordinated international ridge community. When InterRidge began, ridge research was characterised by numerous national groups working either alone or in limited collaborations on many aspects of ridge science. The first ten years of InterRidge have seen the transformation of these groups into a strong, coordinated and informed community consisting of over 2700 active researchers from 54 countries. Thus, the primary objective of InterRidge can move away from the fostering of contacts within the active community and move more strongly towards the achievement of major, long-term scientific goals.

Substantial input from the InterRidge community has resulted in the formation of the “Next Decade” Science Plan for InterRidge. The science plan, which underwent a number of reviews and considered input from the entire InterRidge community was endorsed at the last InterRidge steering committee meeting, 27-28 June 2003 in Tokyo, Japan. The next decade plan will come into operation from 2004.

The current status of InterRidge member nations is a total of 28 countries: 5 Principal members (France, Germany, Japan, UK and USA), 6 Associate members (Canada, India, Italy, Korea, Portugal and Norway) and 17 Corresponding members (Australia, Austria, Brazil, China, Denmark, Iceland, Mauritius, Mexico, Morocco, New Zealand, Philippines, Russia, Spain, South Africa, Sweden, Switzerland and SOPAC).

InterRidge Working Groups are the principal mechanism for implementation of the InterRidge program. Working Groups, established by the Steering Committee, oversee development and execution of various projects identified by the Steering Committee as areas that require, or will benefit from, international and multidisciplinary collaborations. The main function of the Working Groups is to provide a forum for the InterRidge community to utilise their expertise to define and refine scientific questions and to focus interests, both geographically and thematically. The end products of workshops are

Workshop Reports, which represent a synthesis of international and multidisciplinary efforts to pose the scientific questions and propose how best to address them. As a consequence the workshop reports form the basis of grant proposals and carry the weight of international support and recognition. These reports continue to form an important basis for grant proposals and international and multidisciplinary collaborations.

During the first decade of InterRidge, the three InterRidge themes were subdivided into various Working Groups (WGs):

1. Global Studies (Arctic Ridges Working Group, Global Digital Database Working Group, Global Distribution of Hydrothermal Activity Working Group, Southwest Indian Ridge Working Group)
2. Meso-Scale Studies (Back-Arc Basins Database Working Group):
3. Active Processes (Biological Studies at the Ridge Crest Working Group, Undersea Technology Working Group, Hotspot-Ridge Interactions Working Group, Monitoring and Observatories)

7.3.5 International Ocean-Colour Coordinating Group (IOCCG)

The International Ocean-Colour Co-ordinating Group (IOCCG) was founded in 1996 following a resolution endorsed by the Committee on Earth Observation Satellites (CEOS). The group acts as a liaison and communication channel between the providers and users of ocean color data, promoting international cooperation in various aspects of ocean color science and technology. In 1998, the group became an Affiliated Program of SCOR, which also provides infrastructure support and financial management to the group. IOCCG is chaired by Dr. Trevor Platt of the Bedford Institute of Oceanography, Canada and a Project Office has been set up at the Institute, staffed by a Project Scientist and an Information Officer, both under contract to SCOR. In 1999, IOCCG became an Associate Member of CEOS.

IOCCG consists of an international committee of 20 experts in the field of satellite ocean color, with representatives from the provider community, that is various Space Agencies, as well as the user community (scientists, managers). Part of the mandate of the group is to promote strong international cooperation and coordination in the acquisition, distribution, calibration, validation, and utilization of ocean color data from satellites launched by various nations. Currently, there are eleven ocean color missions in orbit (three from the United States, two from China-Beijing and one each from Germany, India, Korea, China-Taipei, Japan, and the European Space Agency) all of which are producing Level 3 products. One of the Terms of Reference of the IOCCG is to promote the long-term continuity of ocean color data sets by building a multi-sensor, multi-year ocean color archive to examine mid- to long-term changes in phytoplankton biomass. A number of issues need to be addressed before this goal can be achieved, including the calibration of each sensor, inter-calibration among different instruments, algorithm differences and also data-binning issues. Many of these issues are currently being addressed by various IOCCG working groups:

- Ocean-Colour Data Binning Issues
- Comparison of Atmospheric Correction Algorithms
- Co-ordination of Merged Data Sets
- Operational Ocean Colour
- Standardizing the Extraterrestrial Solar Flux Spectrum
- Radiometric Calibration of Satellite Ocean-Colour Sensors
- Sensor Characterisation
- Ocean Colour Algorithm Working Group

Training and capacity building has been one of the IOCCG's main areas of focus over the past year. Many developing countries require training on how to use remotely sensed ocean color data, in conjunction with models, to produce useful products. For this reason, IOCCG sponsored an advanced training course on "Primary Production: Theory, Modelling and Estimation by Remote Sensing" at the University of Concepción, Chile (October 21 to November 1, 2002). A total of 26 students attended the course, 8 of whom were from Chile and 18 from elsewhere (7 other countries, primarily in Latin America). Students attended lectures on many aspect of ocean color and also received hands-on training in the acquisition and processing of ocean color data for regions of their interest. The data was used to estimate primary production for the region concerned. Students also received training on the use of MATLAB.

7.4 Other Organizations

7.4.1 Partnership for Observation of the Global Ocean (POGO)

POGO met in Hobart, Tasmania, Australia at the same time as the 2003 IGBP-SC meeting and John Field represented SCOR. The next POGO meeting will be held in Yokohama, Japan and Akira Taniguchi will be representing SCOR at that meeting. John Field reported on the POGO meeting in Tasmania and described the nature of POGO and fact that it links to GOOS. Field also mentioned SCOR's support of the POGO-IOC-SCOR Visiting Fellowships for Oceanographic Observations.

7.4.2 Ocean Studies Board, U.S. National Academy of Sciences: International Global Ocean Exploration (IGOE) Workshop

SCOR assisted the U.S. National Academy of Sciences' Ocean Studies Board (OSB; also the U.S. SCOR Committee) in convening an International Global Ocean Exploration (IGOE) workshop in 2002. The interim report from the activity had been published and the final report was to be published about the time of the Executive Committee meeting. Miriam Kastner, an OSB member and SCOR Nominated Member, reviewed the history of this activity. In December 2000, the U.S. Congress passed the *Exploration of the Seas Act*. The OSB appointed a committee, which held six meetings and a large international workshop. Kastner acknowledged the role of SCOR in organizing the international workshop and helping ensure international participation. A summary of the workshop will be an appendix in the final report, which will be

entitled *Voyage into the Unknown: Ocean Exploration in the 21st Century* (see <http://books.nap.edu/catalog/10844.html>). The report contains five main recommendations:

1. A new program for ocean exploration is necessary.
2. An international, top-down program is not feasible at the outset.
3. The United States should lead by example and develop a national program with international representation.
4. The United States should operate the program using an independent (nonfederal) entity.
5. Federal funding for the independent organization should be provided through either the National Oceanographic Partnership Program (NOPP), NSF, or the National Oceanic and Atmospheric Administration (NOAA).

Priorities are related to the degree of international interest, including marine biodiversity, polar oceans, marine archeology, deep water and its role in climate change, and exploring the ocean through time. The idea of ocean exploration was controversial at first because many researchers didn't understand the distinction between exploration and research, which Kastner described: exploration may not test a specific hypothesis and emphasizes observation and description (not including independent verification). A goal of the program is to get new funding without impinging on existing programs.

Urban noted that SCOR agreed that it should play a role to internationalize what was otherwise a single-nation effort. SCOR has no obligation to continue its involvement in any activity that develops. Urban gave his views to the IGOE Committee on possible international structures for an IGOE, at one committee meeting, and in writing. SCOR needs to keep an eye on developments and see what is appropriate for SCOR involvement. Gordon McBean expressed his concern about so many new projects developing, building from national level out, rather than looking at what is already available internationally. Wendy Broadgate also expressed her concern about potential duplication and that the IGOE program should look for collaboration with other efforts, at the very least. Kastner concluded by saying that she hopes SCOR will be involved.

7.4.3 Alfred P. Sloan Foundation

Jesse Ausubel, a program director at the Alfred P. Sloan Foundation, suggested that SCOR convene a small "summit meeting" of leaders of major ocean international field programs (e.g., GLOBEC, GEOHAB, CoML, IMBER, LOICZ). All of them have some needs in common, such as GOOS (contributions to and needs from), data assimilation, and data management. It would be a pity if each project developed its own data systems that were not inter-operable. Such a meeting could involve two or three people from each project to discuss such issues. Participants might develop ideas on common protocols and a common approach to shared issues. Sloan would welcome a proposal for the funding of such a meeting. Urban noted that SCOR and IGBP are convening a meeting on data management in early December, and have invited OBIS to be involved. This is an early stage in the approach suggested by Ausubel. Robert Duce added that

the meeting proposed should be a larger group than just the IGBP and SCOR programs. Gordon McBean was favorable about the idea.

8.0 ORGANIZATION AND FINANCE

8.1 2004 Election of SCOR Officers

The election process for 2004 officers began at the Executive Committee meeting, with the appointment of a Nominating Committee, with John Field as Chair, assisted by Wolfgang Fennel (Germany), Huasheng Hong (China-Beijing), and Graham Shimmiel (UK). The nominating committee will be asked to recommend co-opted members again, considering that a young scientist might be brought into the Executive Committee as such a member. John Field reported that SCOR has 6 officers: President, Secretary, Past-President, and three Vice-Presidents. Robert Duce must step down in 2004, having reached the end of his term as SCOR President. Julie Hall would normally step down as well, but will stay on for 2 years in order to get the term of the SCOR Secretary out of step with that of the President. This change in the SCOR Constitution was approved in 2000, so Hall will remain as Secretary until 2006. Roberto Purini has served two terms as Vice-President and thus is not eligible for re-election. The other two Vice-Presidents may be re-elected. The election procedures were reviewed briefly, including the closing of nominations on 27 May 2004, four months before the beginning of the SCOR General Meeting.

8.2 Membership

8.2.1 National Committees

Argentina withdrew from membership in 2002, due to financial considerations. Mauritius made inquiries to the SCOR Secretariat about membership, but no further action occurred. Michael MacCracken suggested working through IAI to reach other potential Latin American members. He added that very few small island states are involved in SCOR and that SCOR should try to develop links through the organizations of these states. Umit Unluata replied that such countries have a hard time attending UN-type meetings and would have to have financial help to attend SCOR meetings.

Robert Duce and Ed Urban made presentations to the U.S. National SCOR Committee in July 2003. Duce and Urban attempted to set up a meeting with the Chilean SCOR Committee in January 2003 in conjunction with the IGBP-SC meeting, but the timing conflicted with summer holidays in Chile.

8.2.2 Proposed New Membership Policy

The 2002 General Meeting accepted the report of the Membership Procedures Committee (chaired by Wolfgang Fennel) with some modifications accepted by the Executive Committee. The next action will be to set steps and a timetable for implementation of the new policy.

John Field introduced the recommendations of the Fennel committee. The Invited Member category will be used to encourage new countries to become members of SCOR, making sure to get three Invited Members from these countries in order to initiate a network in the country and ensure everything isn't under the control of one person. Invited Members are not eligible to vote, nominate officers or propose working groups. They will be appointed for two years, with the potential for two additional years, depending on their level of interest and involvement. SCOR should re-evaluate this approach after four years, and determine if the constitution should be modified.

Suspension of countries that have fallen behind on payments will occur after four years of non-payment by Category 1 and 2 countries, and three years of non-payment for countries in Categories III to V. Suspended members can be re-instated by paying the current year's dues plus a mutually agreed amount of arrears. The status of suspended members will be reviewed at each General Meeting until it is clear that no progress is being made, when the members will be removed. Some countries with consistent problems may be offered Observer status (e.g., Bangladesh). Implementation of the new policy will be a topic for discussion by the SCOR Executive Committee in 2004.

8.3 Publications Arising from SCOR Activities

Publications from Working Groups and Major Projects—The special issue of *Progress in Oceanography* from WG 108 was published in March 2003. The synthesis book from the JGOFS project, entitled *Ocean Biogeochemistry: The Role of the Ocean Carbon Cycle in Global Change* was published in mid-2003, in time for the final JGOFS Open Science Meeting. Two additional special issues (for WGs 112 and 113) are due to be published by the next SCOR meeting. Links have been added to the Publications page of the SCOR Web site to the publishers' Web sites, so SCOR reports can be ordered easily. The publications listed on the SCOR Web site are peer-reviewed publications and books from SCOR activities, plus major project plans. Projects maintain their own lists of all project publications on their Web sites, which are linked to the SCOR Web site.

2002 *SCOR Proceedings*—The *Proceedings* was printed in late June and was distributed by the end of July. 650 copies were ordered this year to ensure enough copies to last until the next *Proceedings* is printed.

SCOR Brochure—The SCOR brochure is updated occasionally and given to potential sponsors, potential member nations, and others. The brochure is now available in English, Spanish, and French. Copies of the brochure were taken to the IOC meeting in June.

SCOR Web site—A calendar of SCOR meetings was added to the SCOR Web site, with links to the Web sites for specific meetings, where available. Information for the Executive Committee Meeting was placed on the Web site for the first time, including sections of the background book. The Web site now includes information for the Executive Committee, including a PowerPoint presentation about SCOR. The request made at the 2002 meeting to add scientific highlights related to SCOR activities has not yet been accomplished.

SCOR Poster—A draft SCOR poster had been developed and was available for review at the Executive Committee meeting. The large version of the poster will include a pocket for SCOR brochures, so the brochure should be redesigned, if possible, to complement the poster. Julie Hall solicited comments on a draft poster, which was approved. A large format (A0 size) poster will be printed for the Executive Committee and Secretariat and a smaller version (A3 size) will be printed for all Nominated Members, sponsors, affiliated organizations, and others.

8.4 Finances

The annual audit was performed in mid-February and Elizabeth Gross worked to prepare information for the auditors. The financial records and financial controls were found to follow accepted standards. The large science grant from the U.S. National Science Foundation to SCOR was renewed for three years, starting on June 1, 2003. Two other grants were obtained from NSF for separate activities in 2003, for the ocean carbon observation activity with IOC and the grant for GLOBEC's Ecosystem Studies of Sub-Arctic Seas (ESSAS) meetings. Russia and France paid a considerable amount of dues in arrears, which will help replenish SCOR's cash reserves.

Bjorn Sundby chaired the ad hoc Finance Committee and reported on the following actions of the committee:

- Reviewed auditor's report and found it to be positive (see Annex 15 for the 2002 post-audit financial statement).
- Reviewed reports from the Secretariat and realized that the main issue is financing for working groups. So, the committee developed a set of principles related working group funding:
 1. SCOR must maintain a cash reserve of at least US\$100,000. (This cash reserve is needed to pay SCOR Secretariat and working group expenses in the early part of each year, before annual dues are received, and provides a cash buffer when countries pay their dues late in the year, or not at all.)
 2. It would be ideal if SCOR could finance two new working groups each year.
 3. SCOR must organize its funding in such a way that it doesn't get into a situation in which it can't afford new working groups. Working group proposals should be considered equally regardless of whether they are new or revised from previous years.

4. More than two working groups should be funded each year, if new funds become available and enough high-quality proposals are received.
 5. Working groups should have a maximum budget of US\$45,000.
- Recommended approval of 2003 revised budget
 - Recommended approval of 2004 draft budget
 - Recommended a 1% increase in dues for Category III-V nations and holding the dues constant again in 2005 for Category I and II nations.

Sundby showed a typical SCOR budget and noted that flow-through funds (those obtained from outside sources for specific activities; for these funds expenses equals income) require no decisions. Only US\$375,000 of the US\$1,120,000 2004 budget for SCOR is not flow-through funding, and thus is termed “discretionary.” This includes the Secretariat costs, which runs frugally. Sundby focused on discretionary funds and developed two scenarios:

- Pessimistic scenario—Assumes that only 85% of dues are paid. Adding two working groups in 2003, 2004, and 2005 each would produce a reserve of \$74,000, below the minimum recommended cash reserve of US\$100,000.
- Optimistic scenario—Assumes that 95% of dues are paid. Adding two working groups in 2003, 2004, and 2005 each would produce a reserve of \$160,000.

If we assume that the reality will be somewhere in between these two scenarios, we can support the equivalent of two new groups this year and two in each of next two years. In relation to the working group proposals submitted for 2003, the committee recommends:

- If IMAGES will provide half of the support for two of the new working groups, and IOC will fund GEOTRACES after 2004, the budget will support all three groups and they should be approved.
- Add two additional working groups in 2005 and 2006, depending on the projected cash reserve in each year.

Robert Duce welcomed the report and thanked the committee, especially for the development of some principles. The SCOR Executive Committee accepted all the recommendations of the ad hoc Finance Committee.

8.5 Disciplinary Balance among SCOR Working Groups

Additional information was collected from past chairs of SCOR working groups and was provided to the SCOR Disciplinary Balance Committee, which was charged in 2002 to review this input. The balance has not changed significantly since 2002 and John Field was tasked with summarizing the input from past chairs, for the 2004 General Meeting.

8.6 SCOR Secretariat Personnel Actions

8.6.1 Review of SCOR Executive Director

The initial appointment of Ed Urban was for a period of three years, subject to review of his performance. At the 2002 General Meeting, the SCOR Executive Committee agreed to a review process. The general results of the review—that Urban’s status as SCOR Executive Director be extended—were presented at the Executive Committee meeting, with specific results being discussed with Urban privately. Robert Duce stated that SCOR is delighted that Urban will continue with SCOR. His next review should be done in no less than three years; the exact timing can be determined later. Urban thanked the Executive Committee for their comments and reiterated the importance of such a review process for both SCOR and for him personally.

8.6.2 Hiring of New Administrative Secretary for SCOR Secretariat

The duties of the former SCOR Administrative Officer have been handled by Ed Urban and Elizabeth Gross over the past year. Urban was in the process of interviewing candidates for a new, half-time Administrative Secretary at the Secretariat. The new person will have the primary responsibility for receiving and dispersing SCOR funds and will help Urban with logistical duties in the Secretariat. The Executive Committee believes that filling the position is now a priority. Urban has had trouble finding a suitable candidate through the Johns Hopkins University personnel office, but he hoped to complete the process soon.

9.0 SCOR-RELATED MEETINGS

9.1 SCOR Annual Meetings

The Executive Committee considered potential locations in which to hold future meetings, particularly in nations that have not recently hosted annual meetings.

9.1.1 2003 Executive Committee Meeting – Moscow, Russia

This was the first annual meeting in SCOR history to be held in Russia. Robert Duce expressed many thanks to the Russian Academy of Sciences, the Russian SCOR Committee, and particularly to Prof. Sergey Lappo and Dr. Sergey Shapovalov. Duce presented some small tokens of appreciation from SCOR to Lappo and Shapovalov. Shapovalov responded that the SCOR meeting presence in Russia symbolizes a revival of Russian oceanography.

9.1.2 2004 General Meeting – Venice, Italy

SCOR received an invitation from the Italian National Research Council to hold the 2004 SCOR General Meeting in Venice, Italy, which the Executive Committee accepted. The last annual SCOR meeting held in Italy took place in Rome in 1966, so it is timely to return to Italy. The dates of the meeting were set as 27-30 September 2004. IOCCG will be requested to make a special presentation, to continue the series of presentations by affiliated programs. The Third World Academy of Sciences, based nearby in Trieste, will also be asked to make a presentation at the meeting.

9.1.3 2005 Executive Committee Meeting

The meeting location for 2005 has not yet been determined, as no invitation has been received yet. Catherine Jeandel offered to host a meeting in Toulouse, France. Other participants suggested Norway (which has never hosted an annual SCOR meeting) and China. The locations of recent meetings should be considered in making the decision.

9.1.4 2006 General Meeting – Concepción, Chile

The Chilean SCOR Committee has informally offered to host the 2006 General Meeting in Chile and the Executive Committee has decided to accept the invitation, if it is made formally.

9.1.5 2007 Executive Committee Meeting

A new location for the 2007 Executive Committee meeting will be needed, since the 50th Anniversary meeting was shifted to 2008 (see next item).

9.1.6 2008—SCOR 50th Anniversary—Woods Hole, USA

The Executive Committee has agreed to hold its 2008 meeting in Woods Hole to celebrate SCOR's 50th Anniversary, since Woods Hole was the site of the first SCOR annual meeting, in 1957. The meeting will include some kind of symposium or session that will look backward and/or forward. The Executive Committee decided to postpone the anniversary meeting to 2008, since there are many other activities scheduled for 2007, due to the International Polar Year, and so that the anniversary meeting coincides with a General Meeting. A planning committee will be appointed at the 2004 General Meeting. Robert Duce will develop ideas for a general approach before then.

9.2 Other Meetings of Interest to SCOR

Other SCOR-related meetings are listed in Annex 16. Michael MacCracken requested that IAMAS, IAPSO, and IUGG major meetings should be added to the SCOR calendar. Urban responded that the calendar is limited to meetings of SCOR activities, plus the annual meetings of IGBP and IOC. Adding additional meetings could become a major task and there are already other listings of major ocean sciences meetings, such as the American Geophysical Union Web site.

ACRONYMS

ACC	Antarctic Circumpolar Current
AGU	American Geophysical Union
AICI	Air-Ice Chemical Interactions (SOLAS and IGAC)
AIMES	Analysis, Integration, and Modeling of the Earth System (IGBP)
APN	Asia Pacific Network for Global Change Research
ASLO	American Society for Limnology and Oceanography
CACGP	Commission on Atmospheric Chemistry and Global Pollution (IAMAS)
CCAMLR	Convention on the Conservatio of Antarctic Living Marine Resources
CCC	Cod and Climate Change (ICES and GLOBEC)
CCCC	Climate Change and Carrying Capacity (PICES and GLOBEC)
CEOS	Committee on Earth-Observing Satellites
ChEss	Chemosynthetic Ecosystems project (CoML)
CIRCLE	Climate Interactions, Resources and Carbon Links initiative
CLIOTOP	CLimate Impacts on Ocean TOP Predators (GLOBEC)
CLIVAR	Climate Variability and Prediction Study (WCRP)
CMTT	Continental Margins Task Team (JGOFS and LOICZ)
COASTS	Coastal Ocean Advanced Science and Technology Studies (IOC)
CoML	Census of Marine Life
COSPAR	Committee on Space Research (ICSU)
CPR	Continuous Plankton Recorder
CUFES	Continuous Underway Fish Egg Sampler
DMTT	Data Management Task Team (JGOFS)
EEZ	Exclusive Economic Zone
ENSO	El Niño-Southern Oscillation
EPSG	Equatorial Pacific Synthesis Group (JGOFS)
ESA	European Space Agency
ESSAS	Ecosystem Studies of Sub-Arctic Seas (GLOBEC)
ESSP	Earth System Science Partnership (IGBP, WCRP, IHDP, DIVERSITAS)
FAO	Food and Agriculture Organization (UN)
GAIM	Global Analysis, Interpretation, and Modeling (IGBP)
GCM	general circulation model
GCP	Global Carbon Project (ESSP)
GECAFS	GLobal Environmental Change And Food Systems (ESSP)
GEF	Global Environment Facility
GEOHAB	Global Ecology and Oceanography of Harmful Algal Blooms program (SCOR and IOC)
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection (UN)
GLOBEC	Global Ocean Ecosystem Dynamics project (SCOR, IGBP, IOC)
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GRC	Gordon Research Conference
GSWG	Global Synthesis Working Group (JGOFS)

HAB	harmful algal bloom
HMAP	History of Marine Animal Populations (CoML)
HOT	Hawaiian Ocean Time-series station (JGOFS)
IABO	International Association for Biological Oceanography (IUBS)
IAI	Inter-American Institute for Global Change Research
IAMAS	International Association for Meteorology and Atmospheric Sciences (IUGG)
iAnZone	International Antarctic Zone program
IAPSO	International Association for the Physical Sciences of the Ocean (IUGG)
ICES	International Council for the Exploration of the Seas
ICSU	International Council for Science
IGAC	International Global Atmospheric Chemistry project (IGBP)
IGBP	International Geosphere-Biosphere Programme (ICSU)
IGFA	International Group of Funding Agencies for Global Change Research
IGOE	International Global Ocean Exploration initiative (U.S. NAS)
IGY	International Geophysical Year
IHDP	International Human Dimensions of Global Change Programme (ICSU)
iLEAPS	Integrated Land Ecosystem – Atmosphere Processes Study (IGBP)
IMAGES	International Marine Global Changes Study (IGBP/PAGES)
IMBER	Integrated Marine Biogeochemistry and Ecosystem Research (SCOR/IGBP)
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IOCCG	International Ocean Colour Coordinating Group
IOCCP	International Ocean Carbon Coordination Project (SCOR/IOC)
IOSG	Indian Ocean Synthesis Group (JGOFS)
IPO	international project office
IPY	International Polar Year
IRD	Institut de recherche pour le Développement (France)
IUBS	International Union of Biological Sciences (ICSU)
IUGG	International Union of Geodesy and Geophysics (ICSU)
IUPAC	International Union of Pure and Applied Chemistry (ICSU)
IWC	International Whaling Commission
JGOFS	Joint Global Ocean Flux Study (SCOR and IGBP)
JGTT	JGOFS-GAIM Task Team
LOICZ	Land-Ocean Interactions in the Coastal Zone (IGBP and IHDP)
LME	large marine ecosystem
MA	Millennium Ecosystem Assessment
MAR-ECO	Mid-Atlantic Ridge project (CoML)
NaGISA	Natural Geography In Shore Areas (CoML)
NAS	National Academy of Sciences (USA)
NASG	North Atlantic Synthesis Group (JGOFS)
NOAA	National Oceanic and Atmospheric Administration (USA)
NODC	National Ocean Data Center (NOAA)
NOPP	National Ocean Partnership Program (USA)
NPSG	North Pacific Synthesis Group (JGOFS)

NSF	National Science Foundation (USA)
OBIS	Ocean Biogeographic Information System (CoML)
OOPC	Ocean Observations Panel for Climate (GCOS)
OPC	optical particle counter
OSB	Ocean Studies Board (U.S. NAS)
OSC	open science conference
OSM	open science meeting
PAA	Priority Area Assessment (ICSU)
PACE	Paleocean Circulation Experiment
PACKMEDS	Physics and Chemistry as the Key to Marine Ecosystem Dynamics and Structure (SCOPE, IAPSO, SCOR)
PAGES	Past Global Changes project (IGBP)
PICES	North Pacific Marine Science Organization
P-JTT	Paleo-JGOFS Task Team (JGOFS)
POGO	Partnership for Observation of the Global Ocean
RAS	Russian Academy of Sciences
SCAR	Scientific Committee on Antarctic Research (ICSU)
SCOPE	Scientific Committee on Problems of the Environment (ICSU)
SCOR	Scientific Committee on Oceanic Research (ICSU)
SeaWiFS	Sea-Viewing Wide Field Sensor
SEEDS	Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study
SERIES	Subarctic Ecosystem Response to Iron Enrichment Study
SOLAS	Surface Ocean-Lower Atmosphere Study (SCOR, IGBP, CACGP WCRP)
SOSG	Southern Ocean Synthesis Group (JGOFS)
SPACC	Small Pelagic fish and Climate Change project (GLOBEC)
SSC	scientific steering committee
START	System Analysis, Research, and Training (ICSU)
TT	transition team
UNESCO	United Nations Educational, Scientific, and Cultural Organization
VPR	video plankton recorder
WCRP	World Climate Research Programme (WMO, IOC, and ICSU)
WDC-MARE	World Data Centre for Marine Environmental Sciences (ICSU)
WG	working group
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment (WCRP)

Annex 1 – Special Session on Russian Ocean Science

Integration of Russian and World Science
to Attack an Actual Oceanological Problems

Vyacheslav Lobanov*, Vladimir Ponomarev*, Anatoly Salyuk*, Pavel Tishchenko*, Lynne Talley**, Kuh Kim*** Kyung-Ryul Kim***	New Findings of Recent International Oceanographic Studies in the Japan Sea	*V.I. Il'ichev Pacific Oceanological Institute, FEBRAS ¹ ** Scripps Institution of Oceanography, *** School of Earth & Environmental Sciences of the Seoul National University
Ruslan G. Kulinich	Geological and geophysical research of the Russian Far Eastern Seas	V.I. Il'ichev Pacific Oceanological Institute, FEBRAS
Sergey M. Priamikov, Ivan Ye. Frolov, Alexander I. Danilov, Leonid A. Timokhov	<u>Atlantic Waters in the Arctic Basin: Distribution and Variability</u>	Arctic and Antarctic Research Institute of Hydrometeorological Service
Alexandr V. Klepikov Alexandr I. Danilov Nikolay N. Antipov	Physical Oceanography of the Antarctic Zone of the Southern Ocean: a Review of Russian Studies	Arctic and Antarctic Research Institute of Hydrometeorological Service
Georgy A. Cherkashov	Oceanic hydrothermal systems and submarine gas hydrates: controversial scientific issues	VNIIOkeangeologia of Ministry of Nature Resources
Andrey S. Krovnin, Boris N. Kotenev	Changes in the State of the Main Commercial Fish Stocks in the North Atlantic and North Pacific in the Context of Climatic Variations	Russian Federal Research Institute of Fisheries & Oceanography
Oleg A. Bulatov and Boris N. Kotenev	Prospects of Ecosystem Approach to Fisheries Management	Russian Federal Research Institute of Fisheries & Oceanography
Peter O. Zavialov Andrey G. Kostianoy	Aral Sea Crisis: History, Present Conditions and Future Scenario	P.P. Shirshov Institute of Oceanology, RAS ²
Vladimir P. Tereschenkov, Sergey A. Dobrolubov, Alexey V. Sokov	North Atlantic Water Masses, Meridional Overturning and the Circulation Modes	P.P. Shirshov Institute of Oceanology, RAS
Eugene G. Morozov	Internal Waves and Mixing in the Ocean Based on Moored Measurements and CTD Sections	P.P. Shirshov Institute of Oceanology, RAS

E.M.Galimov*, D.K.Futterer**, R.Stein**, K.Fahl**, O.V.Stepanets*.	Siberian River Run-off into the Kara Sea: Characterization, Quantification, Variability and Environmental Significance	*Vernadsky Institute of Geochemistry and Analytical Chemistry, RAS **Alfred-Wegener- Institute for Polar and Marine Research
Vladimir P. Shevchenko*, Alexander P. Lisitzin*, Ruediger Stein**, Inna A. Nemirovskaya*, Vyacheslav V. Gordeev*, Sergey B. Tambiev*	Sea Ice Geochemistry and Pollution in Arctic and Antarctic	*P.P.Shirshov Institute of Oceanology, RAS **Alfred-Wegener- Institute for Polar and Marine Research
Sergey K. Gulev	Global Climatology of the Sea State: Challenges for Air-Sea Interaction Studies	P.P.Shirshov Institute of Oceanology, RAS
Andrei G. Zatsepin*, Elena G. Arashkevich*, Anna I. Ginzburg*, Andrey G. Kostianoy*, Vyacheslav V. Kremenetskiy*, Vladimir G. Krivosheya*, Sergey V. Motyzhev**, P-M. Poulain*** Sergey. G. Poyarkov*, S.V. Stanichny** Victor M. Zhurbas*	Modern Studies of the Black Sea Dynamics and its Effect on the Marine Ecosystem	*P.P.Shirshov Institute of Oceanology, RAS **Marine Hydrophysical Institute ***Istituto Nazionale di Oceanografia e di Geofisica Sperimentale
Olga S. Temnykh, Gennadiy V. Khen, Igor I. Glebov	NPAFC Bering-Aleutian Salmon International Survey (BASIS): Problems, Prospects, First Results of Investigation in the Western Bering Sea	Pacific Fisheries Research Centre
Nicolay G. Yakovlev	Modeling of the Large Scale State of Water and Sea Ice in the Arctic Ocean	Institute of Numerical Mathematics, RAS
Boris V. Levin	Project of Creation of the International South Kurilean Geophysical Field Experimental Station (ISK GEFEST)	Institute of Marine Geology and Geophysics, FEBRAS
Igor A. Melnikov	Sea Ice Ecosystem in Recent Environmental Changes in the Arctic Ocean	P.P.Shirshov Institute of Oceanology, RAS
Alexander Belov, Victor V. Sapozhnikov	The Changes in the Chemical Basis of Biological Productivity of the Caspian Sea as the Main Cause of Biological Catastrophe	Russian Federal Research Institute of Fisheries & Oceanography

¹ FEBRAS Far East Branch of Russian Academy of Sciences

² RAS Russian Academy of Sciences

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Annex 3 – Agenda

1.0 OPENING

- | | |
|---|--------------------------------|
| 1.1 Opening Remarks and Administrative Arrangements | <i>Shapovalov, Duce, Urban</i> |
| 1.5 Approval of the Agenda | <i>Duce</i> |
| 1.6 Report of the SCOR President | <i>Duce</i> |
| 1.4 Report of SCOR Executive Director | <i>Urban</i> |
| 1.5 Appointment of an <i>ad hoc</i> Finance Committee | <i>Duce</i> |
| 1.6 Committee to Review the Disciplinary Balance of SCOR's Activities | <i>Duce</i> |

2.0 WORKING GROUPS

2.1 Disbanded Working Groups

- 2.1.1 WG 93—Pelagic Biogeography
- 2.1.2 WG 107—Improved Global Bathymetry
- 2.1.3 WG 108—Double Diffusion

2.2 Current Working Groups

- | | |
|--|----------------------|
| 2.2.1 WG 109—Biogeochemistry of Iron in Seawater | <i>Duce</i> |
| 2.2.2 WG 111—Coupling Winds, Waves and Currents in Coastal Models | <i>Wainer</i> |
| 2.2.3 WG 112—Magnitude of Submarine Groundwater Discharge and its Influence on Coastal Oceanographic Processes | <i>Duce</i> |
| 2.2.4 WG 113—Evolution of the Asian Monsoon in Marine Records: Comparison between Indian and East Asian Subsystems | <i>Labeyrie</i> |
| 2.2.5 WG 114—Transport and Reaction in Permeable Marine Sediments | <i>Labeyrie</i> |
| 2.2.6 WG 115—Standards for the Survey and Analysis of Plankton | <i>Pierrot-Bults</i> |
| 2.2.7 WG 116—Sediment Traps and ²³⁴ Th Methods for Carbon Export Flux Determination | <i>Labeyrie</i> |
| 2.2.8 WG 118—New Technologies for Observing Marine Life | <i>Pierrot-Bults</i> |
| 2.2.9 WG 119—Quantitative Ecosystem Indicators for Fisheries Management | <i>Field</i> |
| 2.2.10 WG 120—Marine Phytoplankton and Global Climate Regulation: The <i>Phaeocystis</i> Species Cluster As Model | <i>Hall</i> |
| 2.2.11 G 121—Deep-Ocean Mixing | <i>Purini</i> |
| 2.2.12 WG 122—Mechanisms of Sediment Retention in Estuaries | <i>Labeyrie</i> |

2.3 New Working Group Proposals

- | | |
|---|-----------------|
| 2.3.1 Working Group to plan and implement GEOTRACES, a collaborative multi-national program to investigate the global marine biogeochemical cycles of trace elements and their isotopes | <i>Labeyrie</i> |
| 2.3.2 SCOR/IMAGES Working Group to Investigate the Reconstruction of Past Ocean Circulation | <i>Zatsepin</i> |

- 2.3.3 SCOR/IMAGES Working Group on Analysing the Links Between Present Oceanic Processes and Paleo-Records *Wainer*
- 2.3.4 Working Group on the Physical and Biological Structure of Meso-scale Rings in World's Oceans *Field*
- 3.0 LARGE-SCALE SCIENTIFIC PROGRAMS
- 3.1 Committees
- 3.1.1 SCOR/IGBP Joint Global Ocean Flux Study (JGOFS) *Saino, Field*
- 3.1.2 SCOR/IGBP/IOC Global Ocean Ecosystems Dynamics (GLOBEC) Project *Barange, Taniguchi*
- 3.1.3 SCOR/IOC Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) Program *Hall*
- 3.1.4 SCOR/IGBP/WCRP/CACGP Surface Ocean-Lower Atmosphere Study (SOLAS) *Labeyrie*
- 3.1.5 SCOR/IGBP Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) Project (under development) *Hall, Field*
- 3.1.6 IGBP Land Interactions in the Coastal Zone (LOICZ) Project *Hall*
- 4.0 OCEAN CARBON AND OTHER ACTIVITIES
- 4.1 SCOR/IOC Advisory Panel on Ocean Carbon Dioxide *Urban*
- 4.2 SCOR/IOC International Symposium on "The Ocean in a High-CO₂ World" *Duce*
- 4.3 Other Activities
- 4.3.1 Basin-Scale Modelling *Urban*
- 4.3.2 The Global Iron Cycle *Duce*
- 5.0 CAPACITY-BUILDING ACTIVITIES
- 5.1 Regional Graduate Schools of Oceanography and Marine Environmental Sciences *Field, Wainer*
- 5.2 POGO/IOC/SCOR Visiting Fellowships for Oceanographic Observations *Urban*
- 5.3 NSF Travel Support for Developing Country Scientists *Urban*
- 6.0 RELATIONS WITH INTERGOVERNMENTAL ORGANIZATIONS
- 6.1 Intergovernmental Oceanographic Commission *Duce, Urban*
- 6.1.1 Coastal Ocean Advanced Science and Technology Studies (COASTS) Meeting *Unluata*
- 6.1.2 IOC Policy on Access to Oceanographic Data *Unluata*
- 6.2 Other Intergovernmental Organizations
- 6.2.1 Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) *Duce*
- 6.2.2 World Meteorological Organization *Urban*
- 6.2.3 International Council for the Exploration of the Sea (ICES) *Urban*

7.0 RELATIONS WITH NON-GOVERNMENTAL ORGANIZATIONS

7.1 International Council for Science	<i>McBean, Duce</i>
7.1.1 International Geosphere-Biosphere Program (IGBP)	<i>Broadgate</i>
7.1.2 Scientific Committee on Antarctic Research (SCAR)	<i>Hall</i>
7.1.3 World Climate Research Program (WCRP)	<i>Urban</i>
7.1.4 Scientific Committee on Problems of the Environment (SCOPE)	<i>Pierrot-Bults</i>
7.1.5 International Union of Pure and Applied Chemistry (IUPAC)	<i>Urban</i>
7.2 Affiliated Organizations	
7.2.1 International Association for Biological Oceanography (IABO)	<i>Pierrot-Bults</i>
7.2.2 International Association for Meteorology and Atmospheric Sciences (IAMAS)	<i>MacCracken</i>
7.2.3 International Association for the Physical Sciences of the Oceans (IAPSO)	<i>Morozov</i>
7.3 Affiliated Programs	
7.3.1 Census of Marine Life (CoML)	<i>Taniguchi</i>
7.3.2 International Antarctic Zone (iAnZone) Program	<i>Purini</i>
7.3.3 PAGES International Marine Global Changes Study (IMAGES)	<i>Purini</i>
7.3.4 InterRidge - International, Interdisciplinary Ridge Studies	<i>Labeyrie</i>
7.3.5 International Ocean-Colour Coordinating Group (IOCCG)	<i>Field</i>
7.4 Other Organizations	
7.4.1 Partnership for Observation of the Global Oceans (POGO)	<i>Field</i>
7.4.2 Ocean Studies Board, U.S. National Academy of Sciences: International Global Ocean Exploration Project	<i>Kastner</i>
8.0 ORGANIZATION AND FINANCE	
8.1 2004 Election of SCOR Officers	<i>Field</i>
8.2 Membership	<i>Field, Urban</i>
8.2.1 National Committees	<i>Urban</i>
8.2.2 Proposed New Membership Policy	<i>Field</i>
8.3 Publications Arising from SCOR Activities	<i>Urban</i>
8.4 Finances	<i>Finance Committee, Urban, Gross</i>
8.5 The Disciplinary Balance among SCOR Working Groups	<i>Disciplinary Balance Committee</i>
8.6 SCOR Secretariat Personnel Actions	
8.6.1 Review of SCOR Executive Director	<i>Duce</i>
8.6.2 Hiring of New Administrative Secretary for SCOR Secretariat	<i>Urban</i>
9.0 SCOR-RELATED MEETINGS	
9.1 SCOR Annual Meetings	
9.1.1 2003 Executive Committee Meeting – Moscow, Russia	<i>Duce</i>
9.1.2 2004 General Meeting – Venice, Italy	<i>Purini</i>
9.1.3 2005 Executive Committee Meeting	<i>Urban</i>
9.1.4 2006 General Meeting – Concepción, Chile	<i>Urban</i>
9.1.5 2007 Executive Committee Meeting—SCOR 50 th Anniversary— Woods Hole, USA	<i>Duce</i>
9.2 Other meetings of interest to SCOR	<i>Urban</i>

Annex 4 – Special Session on the Census of Marine Life

Agenda for Census of Marine Life Special Symposium
at SCOR Executive Committee Meeting
Moscow, Russia
19 September 2003

The Census of Marine Life (CoML) became a SCOR-Affiliated Program at the Sapporo meeting in 2002. This Symposium will provide the Executive with a broader perspective on CoML, report on recent developments and highlight and encourage Russian participation.

Friday, 19 September

Session 1

- 9:00 Welcome by Chair of the EuroCoML Committee
Ulf Lie, University of Bergen, Norway (Moderator, 1st Session)
- 9:10 Recent Advances in the Census.
Ron O'Dor, CORE, Washington, D.C.
- 9:30 The History of Marine Animal Populations Project (HMAP)
Daniel Alexandrov, European University at St. Petersburg
- 10:00 Natural Geography In Shore Areas (NaGISA) & Arctic Transect Projects
Vladimir Kasyanov, Far East Science Center, RAS, Vladivostok

10:30 Coffee

Session 2 (Moderator: Ron O'Dor)

- 10:45 **Mid-Atlantic Ridge (MAR-ECO) and Chemosynthetic Ecosystem (ChEss) Projects**
Andrey Gebruk, Shirshov Institute, RAS, Moscow
- 11:05 The Ocean Biogeographic Information System - from Museum to GOOS
Annelies Pierrot-Bults, University of Amsterdam
- 11:25 Discussion followed by a luncheon
- 13:00 Closing presentation. *Jesse Ausubel*, Sloan Foundation, New York

Participants will be available in the afternoon for further discussion of the program.

Annex 5 – WG Proposal on GEOTRACES⁴

Proposal to establish a SCOR Working Group to plan and implement GEOTRACES...

...a collaborative multi-national program to investigate the global marine biogeochemical cycles of trace elements and their isotopes

Submitted 30 April 2003 by:

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On behalf of the GEOTRACES Planning Group

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Abstract

A SCOR Working Group is proposed to provide a platform to plan and implement an international research program to study the global marine biogeochemical cycles of trace elements and their isotopes. Although the primary objective of the proposed program is an improved understanding of the marine biogeochemistry of trace elements, benefits of the program will extend into multiple sub-disciplines of oceanography, as described in the main body of this proposal. The proposed program will be global in its scope and international in the composition of its participants. Furthermore, the program will involve close linkages with several other major international oceanographic research programs. Consequently, the planning and implementation of this program are well suited to take place under the auspices of SCOR.

Activities of the Working Group will include: (1) Organizing national and international planning workshops; (2) Preparing Science and Implementation Plans; (3) Initiating efforts for intercalibration of analytical methods, and for the development of standard reference materials; (4) Defining a policy for data management and sample archival; and (5) Forging scientific linkages with other research programs holding overlapping interests. A working group of 10 members is envisioned initially, but it is anticipated that the size of the group will increase as funds from other sources become available to support the planning and implementation of the program.

⁴ Proposed members' names are removed from working group proposals given in the SCOR Proceedings because SCOR often asks for changes in the group compositions.

Rationale

Trace elements and isotopic tracers play an important role in oceanography; for example, as (1) limiting micronutrients that regulate ecosystem structure and the efficiency of the ocean's biological pump; (2) tools with which to evaluate export production as well as the rates of other processes involved in the ocean carbon cycle; (3) tracers of ocean circulation; (4) proxies used in paleoceanography; and (5) tracers of the transport and fate of pollutants. Much has been learned in recent years about the biogeochemical cycling of trace elements and isotopic tracers, but progress has been limited by the lack of any large-scale coordinated research effort in this area since the GEOSECS program in the early 1970s.

Great advances in the analytical capabilities to measure trace elements and isotopes in the ocean have been made in the quarter century since the completion of GEOSECS, but much remains to be learned about the sources, transport, chemical speciation, biological availability, internal cycling and fate of the broad spectrum of trace elements and isotopes of interest to marine biogeochemists. Advances in chemical sensors, analytical instrumentation, and modeling make possible now research that could not have been envisioned even a decade ago. With the definition of a number of high-priority research questions, and the availability of analytical techniques that permit sampling at high spatial and temporal density, the community of marine biogeochemists believes that the time is right to mount a major international research program to study the global marine biogeochemical cycles of trace elements and their isotopes.

A global study of the marine biogeochemical cycles of trace elements will, simply by its scope, require the resources of many nations in order to achieve its objectives. Coordination and collaboration among international partners would benefit immensely from the status and the connections offered by a SCOR affiliation. In addition, the proposed program will share scientific interests with a number of other research programs. A SCOR affiliation would facilitate the development of scientific linkages with these programs.

Historical Background

Beginning in the late 1990s, informal discussions at international meetings revealed a widespread interest in mounting a coordinated research program to study the marine biogeochemical cycles of a broad array of trace elements and isotopes. To provide a venue for presenting current research interests, as well as to identify important outstanding research questions, a special session on "Trace Elements and Isotopes in Oceanography" was held at the Fall 2001 meeting of the American Geophysical Union (10-14 December, 2001). The session drew a total of 58 titles, illustrating the widespread interest in this topic.

An open forum held during the same American Geophysical Union (AGU) meeting was attended by more than 70 scientists, representing at least eight nations, who were uniformly enthusiastic about the timeliness of, and potential benefits from, a coordinated field program dedicated to the study of the marine biogeochemical cycles of trace elements and isotopes. There was a strong consensus among participants that recent advances in analytical instrumentation and seagoing technology, as well as new insights gained from small-scale and individual research projects, have placed the field in a position that is well poised to make major advances in our understanding of trace element biogeochemistry.

The enthusiastic response of participants in that open forum led to an effort to hold an international planning workshop. That growing effort eventually obtained support from the US NSF Chemical Oceanography Program and the French Centre National de la Recherche Scientifique, as well as from the Observatoire Midi-Pyrénées and the Université Paul Sabatier in Toulouse, France. A planning workshop was held in Toulouse on 13-16 April, 2003, and was attended by approximately 85 participants representing 15 nations. Objectives of the workshop were to:

- 1) Define the principal questions and hypotheses to be addressed in future research on the marine biogeochemistry of trace elements and their isotopes;
- 2) Identify and develop common interests and synergies that would benefit from a coordinated study of the marine biogeochemistry of trace elements;
- 3) Identify beneficial linkages between such a coordinated study and planned activities of other oceanographic research programs (e.g., CLIVAR, SOLAS, OCEANS, LOICZ, PAGES, RIDGE, MARGINS, etc.).

Deliberations during the workshop identified a number of research objectives for the program, and determined that an optimum strategy to achieve those objectives would involve a global study consisting of a number of ocean sections anchored by regional process studies tied to specific sections. Process studies would focus on open questions pertaining to the sources, sinks and internal cycling of trace elements, such as the importance of riverine particles as sources, the mobilization and recycling of trace elements by redox processes in ocean-margin sediments, the removal of trace elements by scavenging in hydrothermal plumes emanating from mid-ocean ridges.

It was the consensus recommendation of workshop participants that the continued development and planning of a research program on marine biogeochemical cycles of trace elements and their isotopes should take place under the auspices of SCOR. That recommendation led to this proposal.

Workshop participants further approved by majority vote that the name of the program should be GEOTRACES. The name is not an acronym but, rather, reflects the intent to study the global marine biogeochemical cycles of trace elements and their isotopes.

Program Objectives

The broadly defined goal of GEOTRACES is to generate a greatly improved understanding of the marine biogeochemical cycles of selected trace elements as well as of stable and radioactive isotopes. In many cases these species serve as tracers of oceanic processes or they function as essential elements in biological processes. A coupled effort linking field studies, laboratory experiments and modeling to more fully elucidate the processes influencing the transport and cycling as well as biological impact of these tracers is envisioned. That information, in turn, would be exported to, and exploited by, other research programs, such as those mentioned in the next section.

More specific goals of GEOTRACES include the following:

- 1) To determine the global distributions of selected trace elements and their isotopes, and to generate a sufficient understanding of their biogeochemical cycles (sources, sinks, transport,

transformations, chemical speciation, biological availability, fates, etc.) to apply that knowledge reliably to interdisciplinary problems.

2) To build and maintain a core community of marine scientists who understand the physical and chemical properties of trace elements and their isotopes, as well as their biological impacts, well enough to exploit them reliably in future interdisciplinary studies.

Beneficiaries and Linkages to Other Programs

Successful completion of the GEOTRACES program will lead to the following benefits:

- 1) An improved understanding of the global biogeochemical cycles of essential micronutrients that are believed to regulate the structure of marine ecosystems and the efficiency of the ocean's biological pump;
- 2) Improved techniques that use natural radionuclides to evaluate the flux of carbon exported from the surface ocean, as well as the dynamics of sinking particulate carbon and other parameters that influence the ocean carbon cycle;
- 3) New tracers of ocean circulation that may result from an improved understanding of the processes by which ocean water masses become labeled with distinct isotopic signatures from selected trace elements;
- 4) The development and calibration of paleoceanographic proxies that are used to assess past changes in ocean circulation, ecosystem structure, biological productivity and carbon fluxes, chemical composition of seawater, continental weathering, and more; and
- 5) Insights into the transport and fate of contaminants for which natural trace elements and isotopes serve as chemical analogs.

The objectives of the GEOTRACES program, together with the anticipated benefits to be derived by fulfilling those objectives, lead to clear linkages to other oceanographic research programs. A non-exhaustive list includes several IGBP programs (OCEANS, SOLAS, LOICZ), as well as PAGES/IMAGES, CLIVAR, RIDGE and MARGINS. Developing the GEOTRACES program under the auspices of SCOR will facilitate the formation of linkages with these programs, and will further ensure that cross-fertilization between programs will lead to maximum mutual benefit through shared information. Furthermore, developing GEOTRACES under SCOR will facilitate the design and implementation of coordinated research activities in which GEOTRACES investigators collaborate with scientists from other programs in joint research initiatives.

Terms of Reference

The SCOR Working Group will serve as the initial core of a planning group who will lead the design and implementation of the GEOTRACES program. Tasks to be performed by that body include:

1. Organizing national and international planning workshops as well as special sessions at international conferences;
2. Preparing Science and Implementation Plans;
3. Initiating and overseeing efforts for intercalibration of analytical methods, and for the development of standard reference materials;
4. Defining a policy for data management and sample archival; and
5. Forging scientific linkages with other research programs holding overlapping interests to create synergies where possible and avoid duplication of efforts.

Meetings

Planning to date for the GEOTRACES program has successfully exploited major international conferences as venues for planning activities. This started with the Fall 2001 AGU meeting in San Francisco, and continued with a special session held at the EGS-EUG-AGU meeting in Nice, France, immediately before the planning workshop in Toulouse. The next event in this sequence will be a special session at the Goldschmidt Conference, to be held in Kurashiki, Japan, in September, 2003. It is anticipated that special sessions will continue to be held at international conferences, and that these will serve as opportunities to schedule planning meetings of the SCOR Working Group.

National and regional planning workshops are being scheduled as well. The first will take place in London (UK) on 29th and 30th September 2003. A U.S. planning workshop is scheduled for the first half of January, 2004, and an organizational meeting in Germany is planned for mid-summer 2003, although the venue is not yet established for either workshop. Organizing efforts for additional workshops is underway. In many nations, a SCOR affiliation would greatly facilitate the acquisition of local resources to hold these meetings.

Working Group Membership

Planning to date, including the organization of special sessions as well as the workshop in Toulouse, has been managed by the following group of marine scientists:

Robert Anderson – Lamont-Doherty Earth Observatory <boba@ldeo.columbia.edu>

Roger Francois – Woods Hole Oceanographic Institution <rfrancois@whoi.edu>

Martin Frank - ETH Zürich <frank@erdw.ethz.ch>

Gideon Henderson – Oxford University <Gideon.Henderson@earth.ox.ac.uk>

Catherine Jeandel - LEGOS (CNRS/CNES/UPS) <Catherine.Jeandel@cnes.fr>

Mukul Sharma – Dartmouth College <Mukul.Sharma@dartmouth.edu>

It is anticipated that each of these individuals will continue to devote a substantial level of time and effort to planning activities, regardless of their designation as full or associate members of the Working Group.

During the program-building phase of GEOTRACES, an evolving membership is envisioned. Initially, full members will be selected to help build national and regional GEOTRACES programs. Associate members will bring expertise in particular processes, and will provide linkages to affiliated research programs. As funds become available to support national and regional planning activities, full members will exchange places with associate members as appropriate to make the most effective use of funds

available to support travel to planning meetings. This strategy is intended to maximize the effectiveness of the planning group.

Members

Each of the proposed members and associate members identified participated in the GEOTRACES planning workshop in Toulouse, at which time the consensus recommendation was to propose that a SCOR working group take the lead on future planning activities. However, because of the short time since returning from the Toulouse workshop (less than 2 weeks at the time of this writing) it has not been possible to contact each of the potential members to ascertain their willingness to serve as a working group member, or associate member. Furthermore, it is anticipated that the list of Associate Members will be expanded. Consequently, there may be changes in the proposed membership before the final proposal is presented to the SCOR Executive Committee.

Annex 6 – WG Proposal to Investigate the Reconstruction of Past Ocean Circulation

Proposal for a Joint SCOR/IMAGES Working Group to Investigate the Reconstruction of Past Ocean Circulation

Abstract

Here we propose to form a working group, jointly supported by IMAGES and SCOR, which will (1) Assess currently available methods and data for assessing past ocean circulation and (2) Devise a plan for field and analytic studies which will lead to a better understanding of past ocean circulation on millennial time scales over the last 120,000 years. This plan will outline a coordinated international project which we will refer to as the Paleocean Circulation Experiment (PACE).

Rationale

Investigations of past climate over the last several tens of millennia have shown that climate can change quite rapidly. For example, at the end of the Younger Dryas temperature jumped about two-thirds of the way from glacial to interglacial values in only a decade. Because of their ability to store and transport heat, the oceans are an integral part of the climate system. It has been postulated that the rapid climate changes inferred from the paleo-climate data result from changes in the Atlantic ocean circulation [e.g., *Alley and Clark, 1999; Rahmstorf, 2002; Sarnthein et al., 1994*].

This hypothesis was driven by data from shell chemistry of foraminifera from deep-sea sediments, which suggested that nutrients were arrayed differently in the Atlantic over the course of these climate changes. However, even for the Last Glacial Maximum the existing nutrient data is insufficient to quantify an alternative ocean circulation state [*Legrand and Wunsch, 1995; Winguth et al., 1999*]. When we turn to the rapid climate change events that occurred during the last glaciation and over the course of the deglaciation, the circulation scenarios based on nutrient reconstructions only become more poorly constrained.

However, there are several less widely applied methods for assessing rates of paleo-ocean circulation. These methods include assessing deep water residence times from Pa/Th ratios in sediments, assessing deep ocean ventilation from radiocarbon measurements in benthic corals and foraminifera, reconstructing geostrophic flows using density gradients inferred from oxygen isotope measurements and reconstructing the strength of near-bottom current speed from physical properties of deep-sea sediments.

The work of this group will be to bring together experts in these fields along with physical oceanographers and ocean modellers to come up with an effective and realistic research plan which will lead to a robust reconstruction of past ocean circulation. We will focus our effort on two timescales. The first is the last 120,000 years (covering an entire glacial cycle, along with most of the millennial-scale climate changes during the last ice age), and the second is a higher resolution look at the period covering the deglaciation (the last 20,000 years).

Scientific Background

Several decades ago it was realized that chemistry of the shells of benthic foraminifera (carbon isotope and Cd/Ca ratios) carried an imprint of the nutrient content of deep water masses [Boyle, 1981; Broecker, 1982; Shackleton, 1977]. This led rapidly to the recognition that the water masses in the Atlantic Ocean were arrayed differently during the last glacial maximum than they are today, and the hypothesis that the glacial arrangement reflected a diminished contribution of low-nutrient North Atlantic Deep Water [Boyle, 1992; Curry and Lohmann, 1982]. More detailed spatial reconstructions indicated a shallow nutrient-depleted water mass overlying a more nutrient-rich water mass in the glacial Atlantic, which led to suggestions of the vigorous formation of a shallower water mass also originating in the North Atlantic. These findings spurred advances not only in geochemistry, but in oceanography and climatology as well, as workers in these fields attempted to simulate the inferred glacial circulation patterns and assess the vulnerability of the modern ocean to such circulation changes.

While the nutrient distributions in the glacial Atlantic Ocean were consistent with a diminished flow of North Atlantic deep water, they also could have reflected an increase in inflow from the South Atlantic and/or a shallower, yet undiminished, deep water mass. Clearly tracers capable of giving information on deepwater flow rate, rather than nutrient content alone, were needed to more fully constrain the glacial ocean circulation. Differences between surface water (measured on planktonic foraminifera) and deep water (measured on coexisting benthic foraminifera) radiocarbon concentrations provided the first rate constraint [e.g., Adkins and Boyle, 1997; Broecker et al., 1988; Shackleton et al., 1988]. Reduced amounts of Pa relative to the more particle-reactive Th in the glacial Atlantic suggested that deep water was exported from the Atlantic during glacial times [Marchal et al., 2000; Yu et al., 1996]. More recently, density gradients (geostrophic shear) in upper waters have been used to infer changes in the upper ocean return flow that compensates the deep water export [Lynch-Stieglitz, 2001; Lynch-Stieglitz et al., 1999a; Lynch-Stieglitz et al., 1999b].

However, even for the relatively well studied last glacial maximum, the existing data are not sufficient to constrain Atlantic Ocean circulation [e.g., Broecker, 2002; Legrand and Wunsch, 1995; Winguth et al., 1999; Wunsch, 2003]. The lack of rate tracer data from many locations, inherent limitations in the nutrient tracer proxies, and insufficient chronological constraint probably all contribute to this inadequacy. Needless to say, the nature of last glacial maximum ocean circulation in the relatively data-poor Pacific, Indian and Southern oceans is even more poorly known than for the Atlantic Ocean. Again, while there is good evidence that the water masses were arrayed differently in these oceans, the data appears to be insufficient to quantitatively constrain the circulation changes. And, perhaps most importantly, even for the Atlantic Ocean, the time history of circulation changes over the millennial-scale abrupt climate changes are also very poorly constrained. Evidence from carbon isotopes in benthic foraminifera is difficult to interpret, with carbon isotope excursions not related in a consistent one-to-one fashion with the millennial-scale variability observed in the surface ocean and ice cores. These inconsistencies are evident both for different events within individual sediment cores [Elliot et al., 2002; Oppo and Lehman, 1995] and between different core locations for the same event [e.g., Curry et al., 1999]. It is possible that the complex patterns seen in the carbon isotope records stem from the concurrent changes in deep water density as well as rates and location of formation. Adequate chronologic constraints are also necessary to reconstruct past ocean circulation states on these millennial time scales. For ages greater than 40,000 years before present, radiocarbon dating must be supplemented

by other methods. As more attention focuses on the possibility that the meridional overturning circulation plays a primary role in sub-Milankovitch-scale climate variability, it is crucial that we know how the strength of the overturning circulation changed on these time scales.

Understanding how ocean circulation changed in association with the abrupt climate changes during and since the last ice age is of prime importance to a broad scientific community. There is no theoretical reason why the mass circulation of the glacial ocean cannot be reconstructed from a well designed database of tracer distributions and measurements of paleo-geostrophic shear [Wunsch, 2003]. A systematic assessment of the methods of reconstruction of past ocean circulation, along with a well thought out plan for a substantial data gathering effort are clearly needed if the paleoceanographic community is to make substantial progress on this problem. Our effort will focus on the last 120,000 years, with a special focus on the last 20,000 years. The former time period covers an entire glacial cycle, and all of the millennial-scale climate variability during the last ice age. The chronology for this interval is currently improving with innovations in U/Th dating as well as detailed work in paleomagnetism of sediments. The latter time period encompasses the last glacial maximum, the most recent Heinrich event, the Younger Dryas climate reversal on the deglaciation, as well as the Holocene and is entirely within the range of radiocarbon dating.

Terms of Reference

This working group will undertake the following tasks:

- (1) *Assess the existing paleoceanographic methods for reconstructing the history of ocean circulation over the past 120,000 years.* Are the existing methods sufficient for a robust reconstruction of past ocean circulation? Are existing chronological tools sufficient to reconstruct distinct ocean circulation states? If not, what developments are necessary?
- (2) *Assess the available paleoceanographic data for reconstructing the history of ocean circulation over the past 120,000 years.* Can robust conclusions on past ocean circulation be drawn from the existing data? For what time periods and locations?
- (3) *Develop an effective and realistic implementation plan to quantitatively assess the hypothesized changes in ocean circulation during over this same timescale.* The group would identify a minimum array of global locations and data types which would help to constrain changes in ocean circulation linked to major climatic changes, bearing in mind the potential for collecting appropriate geologic material as well as the size of the expected circulation signal relative to the uncertainties in the methods. Through international cooperation within IMAGES and ODP existing cores would be identified and plans for new coring to meet these objectives would be discussed.

Relationship to SCOR Objectives

This working group is particularly relevant to SCOR for several reasons. (1) Any research plan for progress in reconstructing past ocean circulation will require the full coordination of efforts of the international community. SCOR has the experience and support to mount international working and operational groups. (2) In addition, this will be an interdisciplinary group which will draw on the full expertise of members of all fields of modern and paleo-oceanography (numerical analysis and modeling,

physics, chemistry, biology, geophysics, geochemistry, sedimentology). (3) Ultimately, any research plan will involve extensive sampling along the continental margins of the world ocean. The sampling will take place in the EEZ of many countries, including developing countries. It will be particularly valuable if young scientists from these countries are incorporated into the research program as Ph.D. students and post-doctoral scientists.

Relationship to IMAGES-PAGES-IGBP Objectives

A robust reconstruction of past ocean circulation is vital if we are to understand how ocean circulation is linked to the dramatic changes in climate that have occurred over the past 120,000 years, as well as to understand the role that changes in ocean circulation could play as the climate changes in the future. IMAGES strives to better understand the role of ocean circulation in climate through coordination of research on past climate from ocean sediments. This working group will link closely with other IMAGES working groups such as EPILOG, which is re-evaluating last glacial maximum climate reconstructions and with the ice and continental paleoclimatologists working through PAGES. IMAGES has the experience with field programs involving international action, high sampling resolution and multi-proxy analysis, and the data quality assessment, distribution and archiving needs of such programs. It is anticipated that IMAGES will provide longer term support for the Paleocean Circulation Experiment (PACE) through working group meetings and workshops at the conclusion of the four-year working group proposed here.

Meetings and Schedule of Work

Year 1: Meeting of Working Group at AGU December 2003. The first formal meeting will take place during December 2003 in San Francisco, California, USA in association with the fall meeting of the American Geophysical Union. At this meeting the goals and agenda of the working group will be laid out. Planning for the Year 2 workshop (goals, agenda, list of invited speakers) will be discussed.

Year 2: Workshop at Lamont-Doherty Earth Observatory, Palisades, New York, USA November 2004. This workshop will bring together experts in various methods of paleoceanographic reconstruction with inverse modelers who have worked on constraining past and present ocean circulation using sparse data sets. Talks will be given in these areas, as well as reviews of existing data sets. Ample time will be allotted to discussion. Additional funds will be secured from U.S. funding agencies to bring in a diverse group of researchers in addition to the Working Group members. The workshop will conclude with a working group meeting outlining work assignments and schedule toward producing the planning document.

Year 3: Meeting at EGS April 2005. Finalize recommendations for planning document.

Year 4: By the end of Year 4, the planning document will be completed.

Products

1. The primary product of this working group will be a comprehensive planning document for a large, coordinated international program to reconstruct past ocean circulation (PACE, Paleocean Circulation Experiment). This report will incorporate the results from the above assessments and be distributed as a pdf and printed document.
2. A report to *EOS*, the newsletter of the American Geophysical Union, documenting the tasks and results of the working group.

3. A set of papers in a specialized journal resulting from the presentations and discussions of the workshop.
4. A set of downloadable overheads (pdf) for the IMAGES/PAGES Web site summarizing the results and plans of the working group.

Working Group Membership

The proposed membership attempts to strike a balance between experts in ocean modeling and inverse methods and experts on paleoceanographic reconstruction, between experts of various nationalities and between various SCOR membership categories.

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Annex 7 – WG Proposal on Analyzing the Links Between Present Oceanic Processes and Paleorecords

Proposal for a SCOR Working Group

ANALYSING THE LINKS BETWEEN PRESENT OCEANIC PROCESSES AND PALEO-RECORDS

Background and Rationale

In the last decade, studies at increasing spatial and temporal resolutions have highlighted that many of the key ocean processes show variabilities on all time scales from short events over seasonal to decadal or longer term. In most cases, the temporal scale of these variations and their feedbacks to different components of the Earth System cannot be observed adequately by direct observation. Modern oceanographic observations can only provide a snapshot of the present variability of the ocean, but over time scales exceeding the past few decades, this variability is not known. For example, the biogeochemical significance for carbon draw-down of major surface blooms cannot be assessed without examining evidence of their occurrence and variability in the past from the sediments. Although much progress in our understanding of the functioning of the ocean system has been gained by modern process studies, a much broader insight into the role and response of the ocean to climate change can only be achieved if the period of direct observation can be extended to include past changes of the ocean system. Ocean properties of the past can be reconstructed from naturally occurring biological, geochemical and sedimentological indicators that are collectively known as “proxies” and by the direct observations of ancient flux events preserved in laminated sediments.

Recent oceanographic experiments have highlighted the importance of certain key species as major drivers of biogeochemical processes, such as export of particulate organic carbon, nitrogen fixation, production of dissolved organic matter, and calcification. An example with major consequences for the oceanic pCO₂ is the evolution of plankton systems dominated by siliceous or carbonaceous species. Observations over the past few decades suggest that carbonaceous species are increasing in the North Atlantic (Deuser et al. 1995, Antia et al. 2001), but the underlying causes are not understood, nor do we know whether such shifts have occurred regularly in the past due to variable preservation of these biominerals. Other examples are the long-term shift in nitrogen-fixing organisms observed at the time-series station HOT (Hawaii Ocean Time-series station) (Karl et al. 1997, Karl et al. 2001) or an ecosystem shift detected in many variables in the Bering Sea (Coyle and Pinchuk 2002, Macklin et al. 2002, Iida et al. 2002) and Northern Pacific Ocean (Hare and Mantua 2000). Several recent oceanographic experiments have observed intriguing blooms of diatoms associated with nitrogen fixing cyanobacteria (e.g., Carpenter et al. 1999; Scharek, et al. 1999), but we rely on recent studies of ancient sediments (Kemp et al. 1999) to learn that such species have sedimented massively in the past and may, therefore, be key players in biogeochemical cycling. Changes in biodiversity, from plankton to higher organisms, are critical sources of information on pre-anthropocene ecosystems’ evolution. Documenting the shifts between these ecosystem states and understanding their causes, using combined insights from modern oceanographic experiments and proxies from the sediment record will provide insights into the physical and geochemical processes that drive ecological change and into biogeochemical feedback processes. Unfortunately, there is still a considerable lack of proxies preserved in sediments for key plankton functional groups and species that do not leave an easily recognized fossil record, such as soft-bodied organisms without shells,

although recent findings look promising (e.g., Dahl et al. 2003).

The knowledge of changes in paleoproductivity is a key to understanding how external factors affect biogeochemical cycles. Unfortunately, the intuitively obvious approach to reconstruct past changes in ocean productivity from the profiles of organic carbon in the sediments is not valid, as there is no simple, direct relationship between the burial rate of organic carbon and the biological productivity of the overlying waters. Therefore, a range of different indicators of past productivity and nutrient utilisation have been developed, including specific organic biomarker compounds (e.g., alkenones from coccolithophorids; dinosterol from dinoflagelates; brassicasterol from diatoms or pigment transformation products of chlorophyll), barium (e.g., Dymond et al. 1992, Francois et al. 1995), $^{231}\text{Pa}/^{230}\text{Th}$ and $^{10}\text{Be}/^{230}\text{Th}$ ratios (e.g., Kumar et al. 1995, Anderson et al. 1998), species composition of planktonic and benthic foraminifera (e.g., Mix 1989, Herguera and Berger 1991, Thomas et al. 1995), diatom species assemblages (e.g., Sancetta 1992; Abrantes, 2000) and flux of diatom shell material (opal) (Ragueneau et al. 2000). Nutrient availability in the paleo-ocean has been reconstructed from the carbon isotopic composition and the Cd/Ca ratio of planktonic foraminifera (e.g., Labeyrie and Duplessey 1985, Ninnemann and Charles 1997), N isotopes (e.g., Calvert et al. 1992, Francois et al. 1992, Altabet and Francois 1994, Ganeshram et al. 1995, Sigman et al. 1999) and recently also Si isotopes (De la Rocha et al. 1998). Careful calibrations of such methods are essential and severe limitations inherent in these methods have been highlighted in many studies. Progress has been made through the comprehensive biogeochemical process studies of JGOFS. However, because this research was not always afforded high priority during the design of JGOFS programmes, progress occurred at a limited pace and much more remains to be done.

Paleoceanographic studies are an important approach to understand past biogeochemical states of the ocean, but they are also afflicted by a considerable degree of uncertainty. At present, the relationship between proxies and ocean properties are usually derived empirically. The danger with these empirical relationships is that they may be valid only within the restricted parameter space of their calibration. Unequivocal interpretation of a proxy record requires a mechanistic understanding of the processes that control its formation and its preservation in the fossil archives. Such a mechanistic approach has been achieved only in few cases, as for instance for carbon isotope fractionation in foraminifera (Wolf-Gladrow et al. 1999, Zeebe 1999, Zeebe et al. 1999). This understanding of the genesis of a proxy signal is unfortunately not available for most proxies.

The rationale behind the formation of this SCOR Working Group is the recognition that considerable advances can be achieved if a mechanistic understanding of the genesis of proxies as well as development of new proxies can be promoted. This, in turn, would allow the test of current hypotheses on the linkages between ocean biogeochemical cycles and climate. Expertise of scientists studying modern ocean processes and those focussing on past changes in the ocean can be fruitfully combined to achieve progress in this important aspect of ocean research. Based on the considerable progress made in both fields in the last decade of IGBP research within the core projects PAGES, JGOFS and GLOBEC, such a collaboration is timely and much supported by experts of both disciplines.

The proposed SCOR Working Group arises from a small task team initiated between JGOFS and PAGES/IMAGES, the Paleo-JGOFS Task Team (PJTT) with the following objectives: (i) improve the

collaboration between the two core projects, (ii) identify regions of specific interest for future research and (iii) propagate these issues into the next phase of IGBP II ocean research programs. In the marine core projects of IGBP and WCRP, links between paleo- and present-day oceanographic studies are included, for instance in CLIVAR, GLOBEC, SOLAS, LOICZ and OCEANS. However, these groups tend to narrowly focus on specific aspects and there is little or no exchange of information between them.

The development of a SCOR Working Group which can form a link between present and past ocean studies in all the different marine IGBP and WCRP programs it is now logical and timely. Such a working group could

- provide a common platform for scientific exchange between the different marine disciplines,
- foster the joint development or refinement of proxies between the different programs,
- bring together a wide range of expertise necessary to better interpret the paleo-records in the light of our present understanding of ocean ecosystem behavior,
- convey benefit to a wide scientific community within Global Change.

This proposal is addressed to SCOR as one of the governing bodies for all marine science programs within IGBP and WCRP.

Terms of Reference

The main objective of the proposed working group is to combine new insights gained from the study of modern biogeochemical processes and ecosystem dynamics, with paleoceanographic studies aiming to improve our understanding of past oceanic processes. In turn, accurate interpretation of the sedimentary record extends the temporal baseline of observation, thus allowing to better gauge the impact of anthropogenic disturbances against natural variability. To achieve this unifying vision, we must

1. Use the new insights gained from contemporary ocean biogeochemical studies to identify or refine our understanding of key oceanic processes and develop or improve proxies for these processes for subsequent use in paleoceanographic studies.
2. Refine established proxies, provide mechanistic understanding and foster the development of new proxies within integrated multidisciplinary process studies in the modern ocean.
3. Use proxy evidence from the sedimentary records to test hypotheses of the oceanic response to climate change.

ad 1) The importance of key oceanic processes, such as nutrient utilization, nitrogen fixation, changes in plankton communities, atmospheric input of iron, inputs from terrestrial sources and changes in components of the higher food chain, have been highlighted by modern process studies. In particular, the potential biogeochemical significance of modern blooms has to be evaluated using key ancient sequences with resolution of fluxes on the time scales of modern ocean processes. Episodic sedimentation makes up the major part of the export to the deep ocean and of the sedimentary record. The sedimentological record has informed us about the significance of these surface events for carbon export and the frequency of their

occurrence beyond the time coverage of modern observations. A correct assessment of this earlier variability and how it is linked to the type of production, export and biodiversity is critical as a reference for understanding our pre-industrial world. Proxies need to be refined or developed to reconstruct the history of these key processes. Biomarkers (including their isotopic composition) and molecular genetics are two new tools that are particularly promising for identifying changes in the biological components, which warrant further development.

The working group will address this question by identifying key processes and key organism groups which are major drivers of biogeochemical changes in the ocean and major carriers of paleo-signals into the sedimentary record. If deficiencies in the proxies are recognized, suggestions will be developed on how to improve them or which type of new proxies are most urgently required.

ad 2) Since the relationships between proxies and ocean properties are usually derived statistically, the interpretation of any proxy record is associated with large uncertainties. Therefore, in order to improve the interpretation and to deconvolute several processes indicated by one proxy, several proxies are often analysed in parallel. Many unresolved issues remain to be addressed and require a mechanistic understanding of the processes that control proxy formation and its preservation in the fossil archives. This can only be achieved by integrating process studies, field data basis and modelling. Such an approach needs to be applied to a wide and growing range of proxies, including siliceous, calcareous and organic microfossils, biomarkers, isotopes and geochemical markers.

Integrating the development and validation of paleoceanographic proxies carried out in different global change research programs is a cost-effective way of refining their interpretation, and the working group will provide a platform for information exchange between scientists in the different programs. This may include providing links between groups involved in proxy validation; integration of experimental work and proxy analysis; and critical evaluation of proxies in a broad disciplinary context.

ad 3) Investigators have sought evidence in marine sediments for the ocean's role in regulating the atmospheric concentration of CO₂ as an important greenhouse gas. It has long been recognized that a change in the efficiency of the biological pump, which is manifest as a change in the inventory of dissolved inorganic nutrients residing in global-ocean surface waters, translates directly into a change in the concentration of CO₂ in the atmosphere (e.g., Broecker 1982; Sarmiento and Toggweiler 1984). Various factors, ranging from changes in wind-driven upwelling (Pedersen and Bertrand 2000), ocean nutrient inventory (Falkowski 1997; Ganeshram et al. 2000) to fertilization by eolian input of iron (Martin 1990) have been hypothesized to induce climate-related changes in ocean productivity. Much of the recent paleoproductivity research has been designed to test these hypotheses. The response of ocean ecosystems to changing environmental boundary conditions are also related to changes in species composition. However, the sensitivity of ocean ecology to perturbations driven by climate change in the past is yet difficult to understand.

The working group will bring together the expertise of modern ocean process studies and paleoceanography to critically evaluate whether the hypotheses and interpretations developed in both fields of research are fully compatible. The results of such discussion groups will be published as joint review papers.

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Annex 8 – Joint Global Ocean Flux Study (JGOFS) Report

Joint Global Ocean Flux Study (JGOFS) Final Annual Progress Report July 2002 to July 2003

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Introduction

The Joint Global Ocean Flux Study (JGOFS) draws to an end this year, a year where we saw the publication of the Springer book on JGOFS synthesis efforts, the release of the national discrete datasets in JGOFS International Collection (DVD) and the presentations of JGOFS achievements and beyond at the highly acclaimed Open Science Conference in Washington, D.C., USA. Although this will be JGOFS' final year as a part of SCOR and IGBP, there remain a number of unfinished JGOFS activities and synthesis products. The tasks include two additional Springer books, one on continental margins and the other on the Indian Ocean, the compilation, production and archival of the "integrated JGOFS dataset" in the WDC system, the printing of JGOFS Reports, and finally the closure of the International Project Office. This year's annual report, therefore, will provide a brief summary and history of these and other activities arranged under the leadership of the Scientific Steering Committee, Regional Synthesis Groups, Working Group and Task Teams. In addition, the report describes briefly the history of the International Project Office (IPO) and its supportive role in these activities, and provides an overview of the available resources and estimated expenses for the past twelve months and the next, and the steps planned for the eventual closure of the IPO in December 2003.

Report on the Synthesis Groups, Working Group and Task Teams

All groups and teams presented a successful completion or advancement of their activities and accomplishments at the 18th Scientific Steering Committee Meeting and the Third JGOFS Open Science Conference, which were held at the U.S. National Academy of Sciences in Washington, D.C., USA, 4 May and 5-8 May 2003, respectively. These events marked the formal end of the JGOFS Synthesis and Modelling Phase. However, several activities of the Synthesis Groups and Task Teams continue. Below are brief reports on these activities, future plans and timelines.

Data Management Task Team

The first meeting of the Data Management (Working Group) Task Team occurred in Halifax, Nova Scotia, Canada, in 1988. This meeting laid the foundation for a solid and workable data policy for JGOFS. Since that meeting, the DMTT has changed the attitude of data managers and scientists regarding the management of non-physical data. On 13-14 March 2003, the DMTT met for the last time in Bidston, United Kingdom. The first day of the meeting focused on a review of the accomplishments from the DMTT, lessons learned and national reports, which were presented at the JGOFS Open Science

Conference.⁵ The second day focused on the production of the DVD "JGOFS International Data Collection. Volume 1: Discrete Datasets". This DVD was distributed during the JGOFS Open Science Conference. It includes an integrated collection of all JGOFS CD-ROMs and data products available by 31 March 2003, **in particular ten contributions never previously released**. For already published products, reproduction agreements were secured. The DMTT holds the copyright for this DVD product, which is structured by countries, projects and cruises, as often as possible. The practical aspects have been handled by the U.S. NODC for the production of the master copy of the DVD and 1,000 copies, with the financial help of the JGOFS IPO. After the distribution at the OSC and to all DMTT representatives, the main repository for the remaining DVD copies is at the World Data Centre A for Oceanography, Silver Spring, MD, USA.

The Pangaea initiative for JGOFS at the World Data Centre for Marine Environmental Sciences (WDC-MARE) is continuing. Its goal is full accessibility and long-term archiving of all JGOFS data and metadata through the WDC system. Yet the pace is slow because of the lack of basic funding. Members of the Pangaea team met last January in Bremen, Germany, with JGOFS representatives to assess the Pangaea initiative with regard to production of the JGOFS master data set (see report at http://www.uib.no/jgofs/Publications/other_pub/JGOFS-PANGAEA_Bremen2003.pdf). The DMTT supports the plan of the Pangaea team to publish a second volume in 2004 or 2005, to be titled "International JGOFS Data Collection. Volume 2: Integrated datasets". All datasets in this volume should be accessible in a common file and data format through the Pangaea user and visualization interface and organised by project, cruise and data set for each parameter. The DMTT and IPO will continue to work with the Pangaea team until JGOFS comes to an end in December, and later on a voluntary basis.

Global Synthesis Working Group (GSWG) and JGOFS-GAIM Task Team (JGTT)

The last meeting of the GSWG and JGTT was in June 2002 at a joint GSWG/JGTT/JRC Workshop on "Global Ocean Productivity and the Fluxes of Carbon and Nutrients: Combining Observations and Models" at the EU Joint Research Centre, in Ispra, Italy. The goals of this workshop were to assess the present state of research on global ocean productivity and downward material fluxes from observations and biogeochemical models, and to identify future research needs. Emphasis was on integrated studies and the comparison between methods. During the course of the three days, participants provided answers to such questions as:

- How accurate are satellite productivity algorithms?
- Are sediment trap data consistent with satellite productivity maps?
- Are benthic food supply requirements matched by measured downward fluxes?
- What controls the export and sequestration efficiency?
- How important are ocean margins for global ocean biogeochemical cycles?
- Are modelled productivity rates and fluxes consistent with observations?
- How will marine biogeochemical cycles change in the future?
- Regarding the next generation of biogeochemical models: what level of complexity is required to improve productivity and flux estimates?

⁵Conkright, M.E., B. Avril, C. Chandler, B. Griffiths, J. Herrmann, M.-P. Labaied, R. Lowry, T. Miyake, J.S. Sarupria and D. Spears, JGOFS Data Management: What has been done? What has been learned?

- New technologies and observations: which new datasets will be available in 10 years? Are they sufficient to validate future models?

Many of the speakers' updated presentations are available as pdf files on the JGOFS Web site (<http://www.uib.no/jgofs/jgofs.html>). A final report on the GSWG/JGTT modelling workshop (Ispra, Italy, June 2002) will be published as a JGOFS Report later this summer: *Global Ocean Productivity and the Fluxes of Carbon and Nutrients: Combining Observations and Models* by Reiner Schlitzer, Patrick Monfray and Nicolas Hoepffner with contributions from Gerhard Fischer, Nicolas Gruber, Richard Lampitt, Marina Levy, Edward Laws, Trevor Platt, Steve Spall, and John Steele.

North Atlantic Synthesis Group (NASG)

The NASG met along with the POMME Synthesis Meeting of the French PROOF program in Toulouse, France. The goal was to present the latest advances in the science and to organize synthesis posters on the North Atlantic Bloom Experiment for the Open Science Conference. A total of 12 posters were presented, including three general synthesis posters by the NASG group:

1. Mike Fasham, Hugh Ducklow, Emilio Fernandez, Véronique Garçon, W. Glenn Harrison, Wolfgang Koeve, Roy Lowry, Laurent Mémery and David Siegel, *Large-scale biogeochemical diagnostics: The North Atlantic carbon machinery*,
2. Hugh Ducklow, Mike Fasham, Emilio Fernandez, Véronique Garçon, W. Glenn Harrison, Wolfgang Koeve, Roy Lowry, Laurent Mémery and David Siegel, *Time-series and process-study sites in the North Atlantic during the JGOFS decade*, and
3. Véronique Garçon, Hugh Ducklow, Mike Fasham, Emilio Fernandez, W. Glenn Harrison, Wolfgang Koeve, Roy Lowry, Laurent Mémery and David Siegel, *Modelling and data assimilation in the North Atlantic: Towards GODAE*.

Other contributed posters covered observational (in situ, satellite data), and theoretical and modeling studies on the North Atlantic Ocean. They described new insights on large-scale biogeochemical diagnostics of the North Atlantic Ocean, synthesis of results of time-series stations and process studies (PRIME, NABE, POMME, AMT, ANIGO, ESTOC, EUMELI, BATS, etc...), and modelling and data assimilation efforts. The latter efforts included studies on the production and transformation of organic matter in the upper ocean and twilight zone, the transport of biogeochemical tracers in the oceans, and their fluxes across the air sea interface and with continental margins and sediments. At the POMME meeting, Wolfgang Koeve presented a talk on carbon over-consumption during the spring bloom in the temperate North Atlantic. A special journal issue on the POMME data synthesis will be published in 2004. POMME data is accessible through the French JGOFS Web site. Two NASG members, D. Siegel and V. Garçon, attended and contributed to the work sessions on the last two days of the IGBP/SCOR OCEANS Open Science Conference in Paris.

Indian Ocean Synthesis Group (IOSG)

Ten countries over six years collaborated on the Arabian Sea Process Studies in order to address the biogeochemistry and physical forcing of this fascinating region. The results from 80+ national and international cruises are now found in over 120 peer-reviewed publications on seasonal monsoonal forcing, circulation, CO₂, primary production, bacterial production, microzooplankton grazing, trophic coupling,

and export flux to the deep ocean. To synthesize this primary literature and data by scientific teams working across national boundaries, the IOSG plans to produce a book manuscript for the IGBP Book Series for review before the end of the summer. The synthesis book will be a coherent and integrated understanding of the key pathways, their interactions and feedbacks in the region. The book editor (S. Smith) and several associate editors plan to meet in Miami this fall and complete the manuscript before sending to Springer for publication in early 2004. A synthesis poster was presented at the Open Science Conference: Smith, Sharon L. *The Arabian Sea: The carbon cycle's response to strong, predictable physical forcing*.

Equatorial Pacific Synthesis Group (EPSG)

The EPSG fulfilled the main goals assigned to the group by the SSC in 1998. The synthesis was published in several *Deep-Sea Research II* volumes, JGOFS datasets were archived in national databases, modelling was advanced as national and international field activities continue, which were presented at the Open Science Conference:

Le Borgne, Robert, Richard Feely and Denis Mackey. *Carbon fluxes in the equatorial Pacific: A synthesis of the JGOFS programme*, and
Barber, Richard T., Robert R. Bidigare, Walker O. Smith, Jr., John Marra and Richard C. Dugdale, *Regulation of productivity rates and yields in oceanic ecosystems: A JGOFS overview with emphasis on the equatorial Pacific Ocean*.

The new projects planned for the region have gathered a strong international interest and future cooperation, which is another JGOFS legacy.

Most of the Equatorial Pacific Process Studies cruises ended in 1996; however, the JAMSTEC cruises are continuing every year in the western and central Pacific in January-February. The PMEL carbon dioxide observations are also continuing routinely along the TAO mooring lines, with eight cruises per year. In addition, two time-series studies, involving CO₂ and bio-optical measurements on TAO are being carried out by PMEL, AOML and MBARI. Two other TAO mooring lines will be equipped with CO₂ and bio-optical sensors.

Many of the biological, chemical and physical datasets from Equatorial Pacific Process Studies have been archived at national data centres and are accessible through the following Web sites:

Australia: http://www.marine.csiro.au/datacentre/JGOFSweb/cmr_jgofs.htm (all data),
France: http://www.obs-vlfr.fr/jgofs/html/bdjgofs_eng.html (all data), and
the United States: http://www1.who.edu/jgdms_info.html (all data).

The pCO₂ datasets are accessible at:

<http://www.pmel.noaa.gov/uwpc2/>,
<http://aoml.noaa.gov/ocd/oaces/index.html>, and
<http://cdiac.esd.ornl.gov/ocd/oaces/index.html>.

Finally, metadata, cruise inventories and most of the data (CD ROMs) were collected, centralized at the JGOFS International Project Office: <http://www.uib.no/jgofs/>, and recently released as part of the JGOFS International Collection of Discrete Datasets (DVD).

Southern Ocean Synthesis Group (SOSG)

The SOSG held a synthesis workshop in Hawaii in February 2002. From September 2002 to May 2003, the SOSG prepared two Southern Ocean synthesis posters for the Open Science Conference: Tréguer, Paul, and Uli Bathmann, *Southern Ocean-JGOFS: A step forward (I) and (II)*, and organised 22 contributed posters. The group also published multiple issues of the *Deep-Sea Research II* over the history of the project. In December 2002, the Australian Antarctic and Southern Ocean science community announced the successful bid to replace the old Antarctic Cooperative Research Centre with a new centre, the Antarctic Climate & Ecosystem Cooperative Research Centre, established in 1 July 2003, which will continue through 30 June 2010. The *ACE Business Plan* is currently available via the Antarctic CRC website www.antcrc.utas.edu.au. ACE plans include biogeochemical process and flux studies, which build on the JGOFS legacy.

North Pacific Synthesis Group (NPSG)

The NPSG held its last meeting immediately after the workshop on Synthesis of JGOFS North Pacific Process Study, 1-2 October 2002, in Sapporo, Japan. The Group discussed (i) a special issue of the *Journal of Oceanography* on JGOFS North Pacific Synthesis; (ii) a CD-ROM with data from North Pacific Process Studies to be produced by JODC, Japan; (iii) presentations at the 3rd JGOFS Open Science Conference; and (iv) JGOFS follow-up programs in the North Pacific. In December 2002, the Group published a special issue of *Deep-Sea Research II* on North Pacific Biogeochemical Processes (Guest editors: T. Saino, A. Bychkov, C.-T. A. Chen and P. Harrison, Vol. 49, Nos. 24-25, pp. 5297-5808). The volume includes an overview of the North Pacific Process Study and 27 contributed papers from Canada, Japan, China-Taipei and Russia.

A special issue of *Progress in Oceanography* (Guest editors: A. Bychkov and A. Peña) dedicated to the memory of the late Prof. Michael M. Mullin is expected in late 2003. In 2001, the NPSG participated in and co-sponsored a topic session on "Plankton size classes, functional groups and ecosystem dynamics: Causes and consequences" at the PICES Tenth Annual Meeting. Selected papers from Canada, Chile, Japan, Korea and the USA will be included in the issue. A second special issue in the *Journal of Oceanography* on JGOFS North Pacific Synthesis (Guest editors: Toshiro Saino, Alexander Bychkov, Chen-Tung A. Chen, Paul Harrison and Ishiro Yasuda) is in progress and publication is expected in early 2004.

Papers describing the Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study (SEEDS) in the western Subarctic Pacific in June 2001 will be published in a special issue of *Progress in Oceanography* in late 2004. The results of an in situ iron enrichment experiment performed in the eastern Subarctic Pacific, the Subarctic Ecosystem Response to Iron Enrichment Study (SERIES) (July-August 2002) are expected to be published as separate papers in *Nature* in early 2004. Arrangements are also in progress to publish other results as a special issue of *Global Biogeochemical Cycles* or *Journal of Geophysical Research*.

A North Pacific data inventory for CO₂ and CO₂-related data developed by MIRC (Marine Information Research Center, Japan) is now available on line at <http://picnic.pices.jp>. This Web site incorporates the extensive information about Japanese cruises and information about Canadian (Institute of Ocean Sciences, IOS) and U.S. cruises (linked to CDIAC holdings). At present, the inventory is linked to original data (at other locations on the Internet) wherever practical, and serves various historical data sets as they are digitized. However, work is in progress to host some datasets at MIRC and to use the Live Access Server approach so as to provide for improved data visualization over the Internet.

Continental Margins Task Team (CMTT)

Over the past 4 years, the CMTT focused its efforts in producing an overall synthesis and assessment of carbon, nitrogen and phosphorus fluxes on and across continental margins for the JGOFS, LOICZ and IGBP-wide synthesis projects. The product of this synthesis will be published by Springer-Verlag in the IGBP Book Series in early 2004. The CMTT held its last workshop on Global Synthesis in Washington DC, USA (4-6 December 2002), which focused on the overall synthesis of the previous four regional workshops. The Task Team and workshop chairs analysed the status of the book, generated policies to accelerate its completion, and selected K.-K. Liu as lead editor. To facilitate communications with the authors and reviewers of the chapters and centralize efforts with the help of the co-editors Atkinson, Quiñones and Talaue-McManus, the IPO approved and supported a part-time book manager for Liu in China-Taipei. After the Washington DC meeting, the contact with the chapters' authors intensified and the peer-review process began. Springer Verlag expects the book manuscript in late 2003 for publication in early 2004.

Paleo-JGOFS Task Team (PJTT)

The PJTT met alongside the OCEANS conference in Paris, France in January 2003 to discuss the future of this task team. Its present aim, namely to introduce the paleo-aspect into the new science plan of the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) project, has been completed. In 2002, an Expression of Interest was submitted to the EU, which resulted in an open call for a targeted programme (STREP), aimed at improving understanding and use of paleo-proxies. In addition, a proposal for a SCOR Working Group was submitted under the title "Analyzing the links between present oceanic processes and paleo-records". The objective of this working group would be to foster the development of proxies indicative of changes in past ecosystems and paleo-productivity. This group would provide a critical link and information exchange between the different IGBP, SCOR, and WCRP marine projects with interest in paleo-records. If successful, this group will continue and expand the work of the PJTT beyond the lifetime of JGOFS.

Scientific Steering Committee

The Scientific Steering Committee (SSC) held its 18th and Final Meeting at the JGOFS Open Science Conference in Washington, D.C. USA (4 May 2003). The committee presently stands at 19 members: 7 at-large members and 12 foci leaders. The current membership is shown in the table below and all 19 terms end on 31 December 2003. The meeting focused on the business remaining of the Synthesis Groups, Working Group and Task Teams. Immediately subsequent to the SSC Meeting, a short celebration followed to pay honour to JGOFS and extend our appreciation to all that served on the committees since the first SSC meeting in Miami, FL, USA, January 1988.

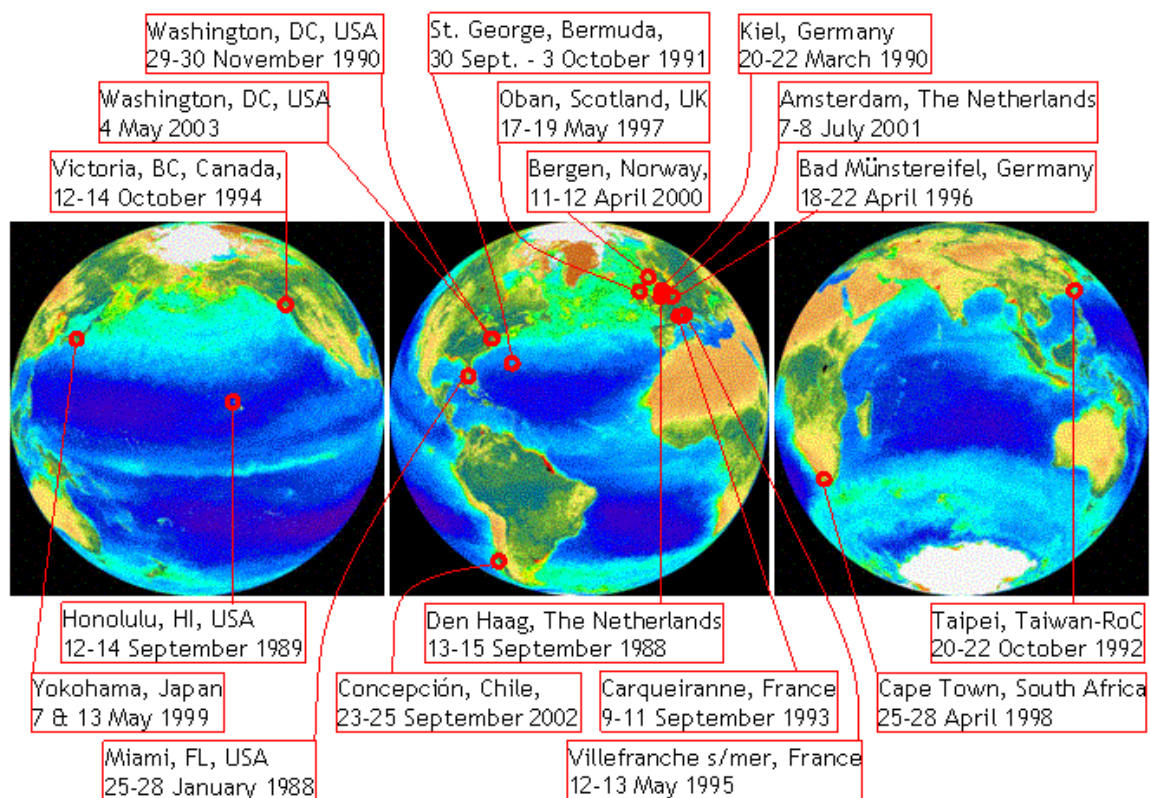
Current Membership of the 18th Scientific Steering Committee

Name	Country	Function	Status	Term Ends
Ducklow, Hugh	USA	Chair	At-large	Dec. 2003
Haugan, Peter	Norway	SCOR/IOC Ocean CO ₂ Panel, OOPC	At-large	Dec. 2003
Saino, Toshiro	Japan	North Pacific SG	At-large	Dec. 2003
Anderson, Robert	USA	SSC, Geochemistry Expert	At-large	Dec. 2003
Hansell, Dennis	USA	SCOR/IGBP IMBER Transition Team	At-large	Dec. 2003
Hong, Huasheng	China-Beijing	SSC, Continental Margins Expert	At-large	Dec. 2003
Tilbrook, Bronte	Australia	SSC, CO ₂ Inventory Expert	At-large	Dec. 2003
Lochte, Karin	Germany	Paleo JGOFS TT	Chair	Dec. 2003
Monfray, Patrick	France	JGOFS-GAIM TT	Chair	Dec. 2003
Quiñones, Renato	Chile	Continental Margins SG	Chair	Dec. 2003
Schlitzer, Reiner	Germany	Global Synthesis WG	Chair	Dec. 2003
Tréguer, Paul	France	Southern Ocean SG	Chair	Dec. 2003
Wallace, Douglas	Germany	SCOR/IOC Ocean CO ₂ Panel	Chair	Dec. 2003
Conkright, Margarita	USA	Data Management TT	Chair	Dec. 2003
Bychkov, Alex	Canada	North Pacific SG	Chair	Dec. 2003
Garçon, Véronique	France	North Atlantic SG	Chair	Dec. 2003
Le Borgne, Robert	France	Equatorial Pacific SG	Chair	Dec. 2003
Platt, Trevor	Canada	Intl Ocean Color C Group	Chair	Dec. 2003
Smith, Sharon	USA	Indian Ocean SG	Chair	Dec. 2003

Brief Historical Perspective of JGOFS Committees and Meetings

A historical view of the Scientific Steering Committees and geographical distribution of its meetings are shown in the figure and table below. Of the 18 SSC Meetings held over the past decade and half, 5 were in North America, 8 in Europe, 2 in Asia, 1 in Africa, 1 in South America and 1 in Bermuda. The figure below shows the actual geographical distribution (city, country, and dates). All told, 68 members travelled to at least two and some to as many as 5 or more meetings over their tenure on the committees.

Geographical location, cities and dates of the 18 Scientific Steering Committee Meetings (satellite images from SeaWiFS Web site, ORBIMAGE / NASA; picture by Bernard Avril)



The average time served by the members was 4.5 years. The membership, including Executive Science Officers, was distributed as follows by country: Australia (4), Canada (6), Chile (1), China-Beijing (2), China-Taipei (2), France (9), Germany (8), India (1), Japan (3), the Netherlands (1), New Zealand (1), Norway (3), Russia (3), South Africa (1), Sweden (1), Switzerland (1), UK (7), and the USA (15) [Total: 68]; By gender and developing-country participation: 7 women (10%) and 5 members (7%) from developing countries. Four Executive Officers and three Assistant Executive Officers supported the committee over the decade and half period.

List of All Scientific Steering Committee Members from 1988-2003. Bold Type indicates Chairs, including the time as Past Chair and Vice-Chairs

Name (last)	Name (first)	Country	Notes	Term(s)	Years Served
Anderson	Robert	USA		1999-2003	4
Bacon	Michael	USA		1990	1
Bathmann	Ulrich	Germany		1998-2000	3

Brewer	Peter	USA		1988-1991	4
Brown	Otis	USA		1988-1994	7
Buat-Ménard	Patrick	France		1991-1993	3
Burkill	Peter	UK		1993-2000	8
Bychkov	Aleksandr	Russia/Canada		1996-2003	8
Calvert	Steven	Canada		1988-1991	4
Chen	Arthur	China-Taipei		1992-1994	3
Conkright-Gregg	Margarita	USA		2000-2003	4
Dandonneau	Yves	France		1990-1992	3
de Baar	Hein	Netherlands		1988-1990	3
Denman	Kenneth	Canada		1988-1992	5
Ducklow	Hugh	USA	Executive Officer, 1993-1995 Chair, 2000-2003	1990-1992, 1996-1998, 2000-2003	10
Duplessy	Jean-Claude	France		1988-1990	3
Elderfield	Harry	UK		1988-1990	3
Emerson	Steven	USA		1993-1995	3
Evans	Geoff	Canada	Executive Officer, 1990-1992		3
Eppley	Richard	USA		1988-1990	3
Falkowski	Paul	USA		1999-2001	3
Fasham	Michael	UK	Vice-Chair, 1988- 1990 Chair, 1998-2000	1988-1992, 1996-2000	10
Field	John	South Africa	Vice-Chair, 1992- 1993 Chair, 1994-1998	1991-1998	8
Garçon	Véronique	France	Vice-Chair, 2002- 2003	1999-2003	5
Hall	Julie	New Zealand		1994-1999	6
Handa	Nobuhiko	Japan		1993-1995	3
Hansell	Dennis	USA		2002-2003	2
Hanson	Roger	Norway	Executive Officer, 1996-2003		8
Harris	Graham	Australia		1991-1993	3
Haugan	Peter	Norway		1999-2003	5
Hong	Huasheng	China-Beijing		1998-2003	6
Hu	Dunxin	China-Beijing		1998-1990	3
Koike	Isao	Japan		1988-1990	3
Kremling	Klaus	Germany		1988-1990	3
Krishnaswami	Seth	India		1991-1996	6

Le Borgne	Robert	France		1999-2003	5
Leinen	Margaret	USA		1991-1993	3
Lisitsyn	Aleksandr	Russia		1992-1994	3
Liu	Kon-Kee	China-Taipei	Vice-Chair, 1998-2000	1995-2000	6
Lochte	Karin	Germany	Vice-Chair, 2001	1995-2003	9
Lowry	Roy	UK		1996-1999	4
McCarthy	James	USA		1995-1997	3
Merlivat	Liliane	France	Vice-Chair, 1995-1997	1992-1997	6
Minster	Jean-François	France		1988-1990	3
Monfray	Patrick	France		1999-2003	5
Moore	Robert	Canada		1995-1997	3
Morel	André	France		1995-1997	3
Murray	James	USA		1996-1998	3
Parslow	John	Australia		1993-1995	3
Pearman	Graeme	Australia		1990-1992	3
Platt	Trevor	Canada	Chair, 1991-1994	1988-1994, 1996-2003	15
Priddle	Julian	UK		1991-1993, 1996-1997	5
Quiñones	Renato	Chile		1998-2003	6
Saino	Toshiro	Japan		1997-2003	7
Sakshaug	Egil	Norway		1994-1999	6
Schlitzer	Reiner	Germany		2001-2003	3
Shaffer	Gary	Sweden		1990-1994	5
Shimmiel	Graham	UK		1995-1998	4
Siegenthaler	Ulrich	Switzerland	Deceased	1991-1993	3
Smetacek	Victor	Germany		1992-1994	3
Smith	Sharon	USA		2001-2003	3
Takahashi	Taro	USA		1995-1997	3
Tambiev	Sergei	Russia		1989-1991	3
Tidmarsh (Gross)	Elizabeth	Canada	Executive Officer, 1988-1989		2
Tilbrook	Bronte	Australia		1996-2003	8
Tréguer	Paul	France		2001-2003	3
Wallace	Douglas	Germany		1999-2003	5
Watson	Andrew	UK		1998-1999	2
Wefer	Gerold	Germany		1990-1992	3
Willebrand	Jürgen	Germany		1993-1998	6
Yoder	James	USA		1996-1998	3
Zeitzschel	Bernt	Germany	Chair, 1988-1991	1988-1991	4

Calendar of Activities from July 2002 through December 2003

In Concepción, Chile, the 17th SSC set the priority for meetings and tentatively allocated funds for activities out to December 2003. The current list of approved JGOFS meetings on the calendar is shown below.

Year 2002 (July - December 2002)

- 17-19 September, Orono, Maine, USA. Equatorial Pacific Synthesis Meeting and Workshop.
- 23-25 September, Concepción, Chile. 17th JGOFS Scientific Steering Committee Meeting.
- 1-2 October, Sapporo, Japan. North Pacific Synthesis Group Meeting and Symposium for the North Pacific synthesis.
- 4-6 December, Washington DC, USA. Continental Margin Task Team Workshop for the Global Synthesis of the Regional Syntheses.

Year 2003

- 7 January, Toulouse, France. Fourth North Atlantic Synthesis Group Meeting.
- 27-29 January, Bremen, Germany. PANGAEA-JGOFS Data Management Workshop.
- 13-15 March, BODC, Merseyside, UK. Data Management Task Team Meeting.
- 4 May, Washington DC, USA. 18th Meeting of the JGOFS Scientific Steering Committee.
- 5-8 May, Washington DC, USA. Final JGOFS Open Science Conference.
- 26 September, Bergen, Norway. JGOFS Executive Meeting.
- To be determined. North Pacific Synthesis Group publication meeting.
- To be determined. Indian Ocean Synthesis Group publication meeting.
- To be determined. JGOFS/LOICZ Continental Margins Task Team publication meeting.

International Project Office and a Brief History

Historical Perspective

Until the host country Norway and the University of Bergen accepted the enormous financial and institutional responsibility of hosting the JGOFS International Project Office, the financial stability and staff of the International Project Office was distributed and limited from 1988-1995. The first office was established within the SCOR Secretariat in Halifax, Canada, but without sufficient staff support to manage the business of a large-scale ocean project. In 1990 in Germany, funds were secured for the office and it was established at the Institut für Meereskunde, Kiel University. The Executive Science Officer position was filled by a secondment from the Canadian government for Dr. Geoff Evans, while the administrative responsibility continued at the SCOR Secretariat in Halifax. In 1993, Professor Hugh Ducklow followed Dr. Evans as Executive Science Officer at the office in Kiel with support from the U.S. National Science Foundation, and the German government extended the Office support for an additional 2 years. In 1995, the SSC initiated a search for new funds to fully support an Office plus an Executive Officer, Assistant Executive Officer to serve as the data and information coordinator, and Administrative Assistant through direct national funding. Several countries were strongly interested in hosting the Office and staff until Norway, through the efforts of Professor Ulf Lie and Dr. Truls Johannessen, secured direct funding from Research Council of Norway and facilities from the University of Bergen. In 1996, Dr. Roger Hanson followed Dr. Ducklow as Executive Science Officer and established the IPO at the Center for Studies of Environment and Resources and has managed the Office

since. The Office has been staffed with an Assistant Executive Science Officer and a secretary/administrative/financial assistant over the past 8 years. The staff continues to provide information and advice to, and serves as the secretariat for, the JGOFS Scientific Steering Committee (SSC) and its planning and synthesis groups, working groups, and task teams. The composition and tasks of the latter are found on the International JGOFS Web site (<http://www.uib.no/jgofs/>). A central task for the past and present IPO is to obtain, evaluate and disseminate information concerning the activities of the scientists involved in the JGOFS field, data analysis and modelling programmes. This information is used to coordinate national activities, to identify planning needs and resource shortfalls, and to help assess, with the SSC, the progress of the project in relation to its scientific goals.

Executive Science Officers (1988-2003)

Ms. Elizabeth Tidmarsh (Gross), 1988-1989
 Dr. Geoff Evans (1990-1992)
 Professor Hugh Ducklow (1993-1995)
 Dr. Roger Hanson (1996-2003)

Assistant Executive Officers (1990-2003)

Dr. Uli Wolf (1990-1995)
 Dr. Beatriz Baliño (1996-2000)
 Dr. Bernard Avril (2001-2003)

Administrative Staff (1996-2003)

Ms. Judith Stokke (1996-2003)
 Ms. Reidun Gjerde (2001-2002)
 Mr. Sturle Litland (2002-2003)

Locations

1988-1989, Department of Oceanography, Dalhousie University, Halifax, N.S., Canada
 1990-1995, Institut für Meereskunde an der Universität Kiel, Germany
 1996-2003, Department for the Studies of Environment and Resources, University of Bergen, Norway

JGOFS SSC and IPO Finances (2002-2003)

In 2002, the project completed an overall operation budget of \$369,221 with funds from the Research Council of Norway, SCOR, IGBP, LOICZ, IOC and the University of Bergen (UiB). These funds covered the administration and activity costs of the project, overheads for the project and facilities, publication costs, travel costs of the committee and activities, such as meetings, workshops and symposia. The total expenditure for 2002 was \$334 666, leaving a balance of \$34 555 from national and international programmes. This sum was carried over to 2003 in support of SSC, IPO and operations. An overview and details of the budget are shown in the table below.

Year 2002 (final)

JGOFS SSC, SG, WG and TT Activities		
Income		Notes
Res. Council of Norway	\$171,415	Administration, travel, Report Series, etc.
SCOR funds	\$85,000	JGOFS SSC meeting and group activities
University of Bergen	\$27,000	Office, supplies, printing, overhead, etc.
IGBP Secretariat	\$20,145	SSC meeting
IGBP Secretariat 2001	\$2,000	Springer-Verlag Publication/Technical

IOC funds	\$7,761	CMTT workshop (returned the balance)
IOC funds	\$11,500	CMTT Global Synthesis Workshop
IOC final installment (Ocean Transport)	\$895	JGOFS WOCE Workshop (2001)
LOICZ funds	\$15,000	CMTT workshop & Global Synthesis
International funds	\$28,505	
Subtotal	\$369,221	

Expenses		Notes
International Project Office	\$171,415	Office Administration (staff)
International Project Office	\$27,000	Office Operations (supplies, travel, reports, etc.)
SSC Meeting (19)	\$31,505	IGBP/SCOR funds/Chile, Training Course
Executive Meeting (5)	\$0	cancelled
Synthesis Groups and Task Teams Activities		
CMTT (10-12)--Subpolar	\$7,923	Joint c/ LOCIZ, IOC
CMTT (10-12) Global Synthesis	\$19,100	Joint c/ IOC & LOCIZ @\$10K each
JGTT (10+20)	\$0	Joint with GSWG (c/ GAIN 10K@ j
NASG	\$0	3 meetings
DMTT (10)	\$3,654	General Business Mtgs/plans
DMTT	\$5,242	Ispra Dataset Rescue
DMTT	Deferred	Bremerhaven Pangaea
PJTT (9)	\$724	Joint c/ PAGES
IOSG	\$364	Ad hoc Mtg in Hawaii
SOSG	\$13,438	Synthesis Workshop, Honolulu, Hawaii
EPSG	\$9,864	Workshop, business mtg, misc (budget \$34K)
NPSG (9)	\$3,208	Meeting and Session @ PICES
GSWG (+ JGTT))	\$28,695	Joint c/ JGTT and GAIM/ Workshop/Ispra

Other meetings and expenses		
IGBP Book managing editor	\$849	Fasham's request for Angela Bayfield
OSC Planning (Haugan)	\$1,270	Meeting-. -Honolulu/ASLO OSM
SCOR Secretariat	\$6,000	estimated travel expenses, Conkright (USA)
JGOFS Synthesis Book/IOSG	\$0	IGBP-\$2K, Technical layout @ Springer-Verlag
JGOFS Reports Series	\$0	SCOR funds
Corrections 2001	\$4,415	
Subtotal	\$334,666	
Balance	\$34,555	international and national residuals

In 2003, project funds are estimated at \$426,045 with funds expected from the Research Council of Norway, SCOR, IGBP, LOICZ, IOC, IAI, APN, START, and University of Bergen (UiB). These funds

will cover the administration and activity costs of the project, for example, staff, overhead for the project and facilities, publication and mailing costs, travel costs of the committee, staff, synthesis groups, and task teams to meetings, workshops and symposia. As of early July 2003, the confirmed expense of the activities is \$243,080 and a positive balance of \$182,965. However, the budgeted Expense for Year 2003 is \$432,400, with an apparent deficit of -\$6,355. We fully expect this deficit will wane by year's end as we complete the budget of several large activities, for example, the Open Science Conference and SSC Meeting, which remains open. An overview and details of the budget are shown in the table below.

Year 2003 (as of July)

JGOFS SSC, SG, WG and TT Activities			
INCOME	Budget	Confirmed	Notes
Res. Council of Norway	\$182,900	\$182,900	Administration, travel, JGOFS Report Series
SCOR funds (2003)	\$85,000	\$85,000	JGOFS SSC meeting and Committee activities
Residual funds international	\$38,000	\$38,000	
University of Bergen (UiB)	\$27,000	\$27,000	Office, supplies, printing, overhead (offices)
Residual funds national	\$30,000	\$30,000	
IGBP Secretariat (2003)	\$20,145	\$20,145	SSC meeting
Funds Raised for LDC scientists	\$45,000	\$45,000	SCOR, IAI, APN, START, IPO
LOICZ Funds	\$10,000	\$10,000	CMTT Synthesis
Subtotal	\$426,045	\$426,045	
Expenses	Budgeted	Expenses	Notes
International Project Office	\$209,900	\$209,900	Administration (staff, supplies, operations)
SSC Meeting (19)	\$40,000		Washington, D.C.
Executive plus Meeting (8)	\$10,000		Bergen
Hotel, Banquet and Nor. guests	\$10,000		Bergen
Synthesis Groups and Task Teams			
CMTT (5-8)	\$10,000		Book Meeting and Springer Verlag layout
JGTT (10)			no meeting planned
NASG (10)	\$11,000	\$3,200	Mtgs in Toulouse, Paris, Nice
DMTT (10)	\$10,000	\$7,000	BODC Meeting
DMTT	\$3,000	\$2,980	Pangaea Meeting (technical)
PJTT (9)			no meeting planned
IOSG (3)	\$5,000		Book Editors Mtg, Miami
SOSG			no meeting planned

EPSG (3)	\$6,000		OSC
NPSG (9)	\$10,000		Mtgs in Japan and China
GSWG (10)	cancelled		Meeting cancelled (14 Feb)
Other meetings and expenses			
GLOBEC Workshop	\$2,500		Trophic food-web modelling
IGBP Congress (Banff)	\$8,000		Banff, Canada participants
IGBP/SCOR OCEANS OSC	\$1,000		Paris, France David Siegel
CMTT (manager + supplies)	\$3,000	\$3,000	Taipei, Taiwan
JGOFS Synthesis Book/IOSG	\$2,000		IGBP-\$2K, Springer Technical layout
3rd JGOFS OSC speakers	\$20,000		
3rd OSC Receptions	\$15,000	\$15,000	NAS, Smithsonian, Banquet
3rd OSC Invitees from IPO	\$5,000		Norwegian guests of the IPO/OSC
LDC Scientists for the 3rd OSC	\$45,000		Africa, S. Am., SE Asia, E. Europe, M. East
DM DVD Production/copying	\$4,000		distributed to the DMTT, OSC, SSC, WDC
SCOR Secretariat	\$2,000		US gov't employee travel
JGOFS Reports Series	\$10,000		GSWG and Publication List
Springer_Fasham_bulk order	\$2,000	\$2,000	40 books paid/shipped/OSC/SSC
Subtotal	\$432,400	\$243,080	
Balance	-\$6,355	\$182,965	

Data Management

During the last period, the Data Management Task Team (DMTT) and the JGOFS International Project Office (IPO) continued to document and compile all data and metadata collected on JGOFS cruises over the last decade. With help from the IPO, DMTT members updated the list of JGOFS core parameters, along with the most common units and metadata. At the end of 2002, the JGOFS Scientific Steering Committee (SSC), DMTT and IPO reached a consensus on a minimum list of JGOFS parameters that participating countries should focus on in their submissions to the International JGOFS Data Collection. The core parameters list was published in JGOFS Report no. 37 in August 2002 in an almost final form. It is available via the JGOFS Web site (www.uib.no/jgoofs/Publications/Report_Series/JGOFS_37.pdf) as a part of the JGOFS legacy.

Through several, very active international meetings, national activities of the DMTT representatives and some international JGOFS collaborations to secure the identification, documentation and inclusion of the relevant datasets, especially for countries not represented in the DMTT, the equivalent of more than 20 datasets was gathered and have been published in the "International JGOFS Data Collection, 1988-2000. Volume 1: discrete datasets" DVD, which was first distributed during the Final JGOFS Open Science Conference, held in Washington, D.C. (USA) in early May 2003. This DVD product, a major component of the JGOFS legacy, includes data contributions from Australia, Canada, France, India, Japan, Netherlands, New Zealand, Norway, Pakistan, Spain, United Kingdom and United States, and represents more than three quarters of all identified JGOFS datasets with some national SysTem Analysis, Research,

and Training for assistance with young and mid-career African and Southeast Asia scientists (START, \$10,000). In addition, the IPO contributed an amount of about \$10,000 for Eastern Europe and Middle East scientists and \$15,000 for Conference Receptions.

Publications

SCOR and the IPO support the printing of the JGOFS Reports (ISSN: 1016-7331) in Bergen, Norway, distribute them internationally free of charge to libraries, institutions and scientists, and make them available as pdf files from the JGOFS Web site. Since July 2002, the IPO has:

- managed the technical editing and printed the following report: No. 37 Data Management Task Team Meeting Minutes, January 2002 & June 2000. August 2002,
- assisted the DMTT with the edition of the DVD "JGOFS International Data Collection. Volume 1: Discrete Datasets", and
- assisted M. Fasham (editor), with the edition of the book *Ocean Biogeochemistry: The Role of the Ocean Carbon Cycle in Global Change*, International Geosphere-Biosphere Programme Book Series Nr. 11, Springer-Verlag, ISBN: 3-540-42398-2, May 2003.

In addition, several special issues have been published as official JGOFS contributions in 2002-2003:

K.-K. Liu, T.-H. Peng, P.-T. Shaw, Circulation and biogeochemical processes in the East China Sea and the vicinity of Taiwan, *Deep Sea Research II*, 50(6-7), 2003 (Continental Margins)

W.O. Smith Jr. and R.F. Anderson, US Southern Ocean JGOFS Program (AESOPS): Part III, *Deep Sea Research II*, 50(3-4), 2003 (Southern Ocean)

S. Tsunogai, K. Iseki, Y. Saito, M. Kusakabe, Biogeochemical Cycle in the East China Sea, *Deep Sea Research II*, 50(2), 2003 (Continental Margins)

T. Saino, A. Bychkov, C.-T. A. Chen and P. J. Harrison, North Pacific Biogeochemical Processes, *Deep Sea Research II*, 49(24-25), 2002 (North Pacific)

J.E. Bauer, D.J. Demaster, D.J. Repeta and P.G. Verity, Biogeochemistry and Cycling of Carbon in the Northwest Atlantic Continental Margin: Findings of the Ocean Margins Program, *Deep Sea Research II*, 49(20), 2002 (North Atlantic / Continental Margins)

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Office Closure

The International Project Office plans to close its offices at the University of Bergen on 31 December 2003, which marks the end of eight successful years in Norway. In September during the final JGOFS Executive Meeting in Bergen, the Executives and the Office will honour our hosts and friends at the Research Council of Norway and the University of Bergen. JGOFS has much to be grateful and appreciative for. Without the continuous financial and facility support over the years, JGOFS and its SSC would not have functioned as well as they have.

Plans are now well underway to transfer and archive JGOFS and IPO holdings and documents to the University of Bergen, libraries in the USA and Norway, the National and World Data Centre system, and to future programmes via IGBP and SCOR. The official financial records covering JGOFS activities/accounts over the past eight years will be held in Norway at the University. Office copies of all transactions will be archived for several years at the Center for Studies of the Environment and Resources. For future reference and access to the financial records, the IPO will provide contact information of the responsible person(s) at the University to SCOR and IGBP. Other complete holdings, such as the JGOFS Report Series, Annual Reports to SCOR, IGBP and Norwegian Research Council over the years will be transferred to the National Library in Norway (Mo i Rana) and all collected series from 1988 to 2003 will be transferred to the Library at the Woods Hole Oceanographic Institution and held with the U.S. JGOFS Planning Office and Data Management records, reports, and historical documents. The JGOFS Web site, which will be maintained regularly, will remain online at least for one year and will also be copied on CD ROMs, to be transferred to the SCOR, IGBP, chosen libraries, and interested individuals, and possibly to future ocean programmes if requested before Office closure.

For further information about JGOFS or any of the activities discussed in this report, please contact Roger B. Hanson, Executive Director, Joint Global Ocean Flux Study IPO, Centre for Studies of Environment and Resources, University of Bergen, 5020 Bergen, NORWAY, Tel: +47-5558-4244, Fax: -9687, E-mail: roger.hanson@jgofs.uib.no, Homepage: <http://www.uib.no/jgofs/jgofs.html>.

Annex 9 – Resolution on JGOFS

RESOLUTION OF THE SCOR EXECUTIVE COMMITTEE (adopted 18 September 2003)

On the occasion of the final meeting of the Executive Committee of the Joint Global Ocean Flux Study (JGOFS), the Executive Committee of the Scientific Committee on Oceanic Research (SCOR) notes with great appreciation the successful conclusion of the JGOFS project. SCOR is pleased to have been the first international sponsor of JGOFS in 1987.

Many individuals and organizations have been responsible for JGOFS' great successes. The SCOR Executive Committee commends the chairs of the international JGOFS Scientific Steering Committee (SSC: Bernt Zeitzschel, Trevor Platt, John Field, Michael Fasham, and Hugh Ducklow) and all the committee members who selflessly volunteered their time and energy to implement the ambitious set of JGOFS activities internationally. The JGOFS Executive Officers—starting with Elizabeth Tidmarsh (Gross) and followed by Geoff Evans, Hugh Ducklow, and Roger Hanson—served in an exemplary manner in guiding the day-to-day operations of the project, seeking funding for the project, liaising with related organizations, and maintaining continuity of project activities between SSC meetings. Roger Hanson has managed the JGOFS International Project Office (IPO) for about half of the life of the project, and he and his staff deserve special credit for their role in seeing the project through from its middle years to its completion at the end of 2003.

The SCOR Executive Committee thanks its sister organization, the International Geosphere-Biosphere Programme (IGBP) for adopting JGOFS as IGBP's first oceanic Core Project in 1989. IGBP's participation in JGOFS has helped integrate JGOFS' activities and results into broader Earth system understanding. This integration was greatly enhanced by the excellent Final Open Science Conference organized by the JGOFS community in Washington in May 2003.

Finally, but not least, the SCOR Executive Committee thanks the many financial sponsors of JGOFS, particularly the Research Council of Norway and University of Bergen for hosting the JGOFS IPO for the past 8 years. IPOs are vital to the health of the large-scale ocean research projects and their support is a major commitment for a nation to undertake. SCOR also thanks other financial sponsors of international JGOFS, including the Kiel University and German funding agencies (for supporting the JGOFS IPO in Kiel before it moved to Bergen), the Canadian and U.S. governments for seconding personnel to the JGOFS IPO at different times, the U.S. National Science Foundation for its significant financial support of the JGOFS SSC and its subcommittees, the International Council for Science for numerous contributions of support for JGOFS activities, the Intergovernmental Oceanographic Commission for support of several JGOFS meetings, and a myriad of other nations and organizations that contributed to the support of JGOFS. JGOFS has demonstrated once again that committed scientists and sponsors are vital ingredients to make a large field research project successful.

Annex 10 – Global Ocean Ecosystem Dynamics (GLOBEC) Report

Report of the SCOR/IOC/IGBP GLOBEC International Programme for 2002 to the SCOR Executive Committee. Moscow, Russia, 15-19 September 2003

Manuel Barange, Director GLOBEC International Project Office
Plymouth Marine Laboratory, UK, m.barange@pml.ac.uk

1. RECENT PROGRESS: Symposia, Working Group and Integration activities

1.1. GLOBEC Open Science Meeting

The Proceedings of the OSM (Qingdao, China, October 2002) will be published as a special volume of *Fisheries Oceanography* in August 2003. The volume includes 27 peer-reviewed papers.

1.2. GLOBEC/PICES/ICES 3rd Zooplankton Symposium. Gijon, Spain, May 2003

This symposium was GLOBEC's largest effort this year, co-sponsored by the International Council for the Exploration of the Sea (ICES) and the North Pacific Marine Science Organization (PICES). The title of the meeting was "*The Role of Zooplankton in Global Ecosystem Dynamics: Comparative Studies from the World Oceans*", and the main goal was to define the "state of the art" in zooplankton ecology and to determine key research initiatives to be pursued in the 21st Century. It was convened by Luis Valdes (ICES), Tsutomu Ikeda (PICES) and Roger Harris (GLOBEC). This was the largest GLOBEC meeting to date, bringing 420 attendees from 50 countries.

The symposium sessions were:

- a) Physical variability and zooplankton population dynamics
- b) Role of zooplankton in biogeochemical cycles
- c) Climate influences: What are the long-term zooplankton data sets telling us?
- d) New approaches to zooplankton modelling
- e) Progress in molecular biology
- f) Application of new technologies
- g) Comparative life histories and life cycles of zooplankton populations within and between the North Pacific and North Atlantic oceans
- h) Microzooplankton in the marine pelagial: Recent advances from molecules to ecosystems

The meeting also included three satellite workshops on:

- Gelatinous zooplankton and fish: Predators, prey or nuisance (Pat Kremer)
- Meso- and bathypelagic zooplankton study: Current status and future aspects (Tom Ikeda)
- Climate variability, zooplankton abundance and distribution – comparative opportunities from the world's oceans (Ian Perry and Hal Batchelder)

The Proceedings will be published as a Special Issue of the *ICES Journal of Marine Science*, edited by Roger Harris, Tom Ikeda, Skip McKinnell, Bill Peterson and Luis Valdes. The submission deadline is 27 June 2003, with a publication date expected for spring 2004.

1.3. Focus 1 working group: Retrospective Analysis and Long-term time series

The working groups of Foci 1, 2 and 3 met in parallel in October 2002, prior to the GLOBEC OSM. Foci 4 met in June 2002 in Sidney, Canada.

Foci 1 WG activities in recent months and plans for the future include:

- The Focus hosted two meetings, in Nov. 2002 and March 2003, in Swakopmund, Namibia, aimed at developing cooperation activities between the Benguela and Humboldt Currents. The second meeting produced a report on “Long-term dynamics of the Benguela and Humboldt: An ecosystem perspective”, to be published in the GLOBEC report series.
- The group submitted an article to the *PAGES Newsletter* to link paleoceanographic efforts under GLOBEC with those under other IGBP programmes.
- A proposal is being drafted to support a workshop on “Ecosystems comparisons” through the Rockefeller Foundation’s Bellagio Conference Centre. This would be part of GLOBEC’s integration and synthesis activities.
- A workshop, funded by GLOBEC and Japanese national sources, will be hosted in Tokyo, Japan, 9-12 December 2003, to continue the Focus’ effort on rescuing long-term data series. Previous meetings in this direction included a rescue effort for the California-Humboldt region (Lima, Peru, May 2001) and Benguela region (Cape Town, February 2001).
- As a result of the Gijon Zooplankton symposium, described above, ICES/PICES/GLOBEC would like to organise a workshop in 2004/2005 to produce a time series of zooplankton abundance in the major oceans, equivalent to the time series of pelagic fish abundance that have been used to develop the concepts of teleconnections and regime shifts in the pelagic domain.
- Focus 1 is developing a review paper on influences of climate on fisheries, to be presented at the 4th World Fisheries Congress in Vancouver, May 2004.
- Finally, a new field activity to obtain paleoceanographic data from the Humboldt Current is to start in 2004. This will address the Foci’s objective of comparing paleoceanographic records in the California, Benguela and Humboldt currents.

1.4. Focus 3 working group: Prediction and Modelling

Main activities of the group in recent months include:

- Focus 3 is leading an IOC/SCOR activity on “Basin-Scale Ecosystem Modelling”. This activity is co-sponsored by PICES, JGOFS and GLOBEC. The group met in Harlow, UK (29 May – 2 June), and included B. de Young, M. Heath, C. Werner, M. Kishi, E. Murphy (Focus 3), F. Chai, D. McGillicuddy (JGOFS), P. Monfray (IMBER) and B. Megrey (PICES). The group intends to produce a review paper for *Science* or *Nature* by late 2003 which will map out the steps involved in advancing marine ecological modelling towards a resolution of the ocean basin, multi-decadal problem, and ultimately a basin-scale prognostic modelling capability. The group will meet again October 22-25, 2003.
- Members of Focus 3 participated in a workshop to develop a marine ecosystem model of the North Pacific Ocean, including pelagic fish in Yokohama (Japan), 3-6 March 2003. The goals of the workshop were to develop a two-way model which includes a prey-predator system between lower trophic ecosystem and fish, and to build a Lagrangian model which can consider fish migration and fish population dynamics embedded in a basin-scale 3-D circulation model. The output will be a set of papers to be submitted to *Ecological Modelling*.
- Focus 3 is preparing a proposal for submission to the APN for funding to secure a workshop on “Climate Interactions and Marine Ecosystems: Effects on the Structure and Function of Marine Food Webs and Implications for Marine Fish Production in the North Pacific Ocean and Marginal Seas”. The request will also include 4-month funding for two post-doctoral fellows, from Russia and China, to conduct preliminary work.
- Finally, the group is considering hosting a workshop on Optical Particle Counter (OPC)/Video Plankton Recorder (VPR) use, following the very successful GLOBEC methodological workshops on the Continuous Underway Fish Egg Sampler (CUFES) and OPC, in 2000 and 2001. This workshop would ideally take place in mid-2004.

1.5 Focus 4 working group: Feedback from changes in marine ecosystem structure

The first meeting of the Focus was in Sidney in June 2002, on the topic of “Social impacts of changes in marine ecosystems”. The central questions identified are:

1. How do marine ecosystem changes affect coastal communities?
2. What are the reciprocal effects of human responses on marine ecosystems?

Additional activities of the group (recent and future) include:

- Organising a session at the 2nd GLOBEC Open Science Meeting on “Social impacts from changes in marine ecosystem structure”.
- Preparing a paper on “Scale issues in marine ecosystems and human interactions”, to be published in *Fisheries Oceanography*.
- A presentation (by R. Ommer) on “Social issues/implications of marine ecosystem changes” at a symposium on “Science for Resource-Dependent Communities” in Anchorage, Alaska (13-17 January 2003). The symposium was sponsored by the Gulf of Alaska Ecosystem Monitoring Program, the Exxon Valdez Oil Spill program, and the U.S. GLOBEC programme.

- A session hosted at the 3rd IGBP Congress on “Vulnerability of coastal communities to natural and human-induced changes in living marine resources”.
- A session at the IHDP Open Science Meeting (Montreal; October 2003) on “Global Environmental Change and Coastal Systems: A Microcosm of Coupled Human-Environmental Systems”. The session is sponsored by GECHS, GLOBEC, IDGEC and LOICZ. GLOBEC’s paper is entitled: “Communities of fish and communities of fishers: Understanding human-ecosystem interactions in the coastal ocean” and is co-authored by R. Ommer, B. Neis and R. Ian Perry.
- GLOBEC Focus 4 is supporting a speaker at the PICES XII Annual Meeting (October 2003 in Seoul, Korea) under the session “Human Dimensions of Ecosystem Variability”. The invited speaker is Lawrence Hamilton, who will present “Ecosystem–Society Interactions in the Northern Atlantic: Human Dimensions of Fisheries Collapse”.

In the immediate future the group will:

- Develop an activity on Eastern Pacific Coastal Fisheries in collaboration with GECaFS (the IGBP/IHDP/WCRP joint project on Global Environmental Change and Food Systems) with the objective of developing strategies to reduce societal vulnerability to changes in marine ecosystem productivity induced by El Niño/La Niña, and other aspects of GEC.
- Initiate planning for a major symposium on “Social Impacts of changes in marine ecosystem structure”, probably for late 2005/early 2006.
- Host the 2nd F4WG Working Group meeting (25-26 June 2003, Banff, Canada) to discuss a review paper integrating natural system and social system models in four regions: NW Atlantic, NE Pacific, the Humboldt and SW Africa.

1.6 GLOBEC Integration and Synthesis

GLOBEC intends to complete its activities in 2009, in agreement with SCOR, IGBP and the IOC. This sets a clear time frame for the SSC to plan integration and synthesis activities. The SSC has developed a plan to tackle this crucial stage of the programme, along the following lines:

- Develop a fast and brief document by the 2004 SSC meeting, to set up the goals, milestones and pathways to synthesis. This would include an inventory of existing syntheses.
- Support the synthesis activities already undertaken by the CCC, CCCC and SO regional programmes (see below), and encourage SPACC to initiate integration and synthesis.
- Consider the possibility of publishing a book with descriptions of the achievements of each national, multinational and regional programme. This should also include the applications of the research.
- Following the above, the Foci WG would work with the SSC in setting up how to synthesise information from the different activities conducted under GLOBEC, using the outcomes of the points above. It may be that at this stage GLOBEC committees would need re-structuring to ensure that we capture GLOBEC’s legacy adequately. Additional funding would have to be identified to activate this phase.

- The SSC will continue to plan for OSMs to continue to build the community and bring up the science.
- The SSC commits to prepare a brief (2-3 pages) research highlights publication every year, to be included in sponsors' reports, and to continue focusing on delivery of promised products.

2. REGIONAL AND NATIONAL PROGRAMME UPDATES (see Annex 1 for more details)

GLOBEC currently has four regional programmes, and has a further two in planning phase.

2.1 ICES-GLOBEC Cod and Climate Change project (CCC)

The activities of the group in recent months and in the future include the following:

- A synthesis workshop held in New Bedford, USA, May 2003. This was aimed at producing a book on cod based upon the activities of the WG, probably to be published in the *IGBP Science Series*.
- A WG meeting to develop a new action plan for 2003-2009, New Bedford, USA, May 2003.
- A theme session on transport of cod larvae at ICES ASC, Tallinn, Estonia, Sept. 2003
- A meeting of the WG, focused on synthesis activities, Bergen, Norway, 7-10 May 2004
- A major ICES-GLOBEC symposium on “*The influence of climate change on North Atlantic fish stocks*”, Bergen, Norway, May 2004, co-sponsored by ICES and GLOBEC.
- An update of the ICES CRR report (205) on *Spawning and Life History Information for North Atlantic Cod Stocks* (originally published in 1994) to be completed over 2004.

As part of the strategic development of the project for 2003-2009, the group intends to conduct annual workshops targeting specific topics:

- Cod survival through the first year of life: Relationship to zooplankton dynamics and sources of mortality (2005).
- Influence of climate on tropho-dynamics of cod ecosystems (2006)
- The decline (and recovery) of cod stocks throughout the North Atlantic (2007)
- The response of cod to climate change scenarios (2007)
- Implications of results from CCC for fisheries management (2008)
- Synthesis II Workshop (2009).

2.2. Small Pelagics And Climate Change

Activities of the SPACC programme are grouped along four main themes.

Theme 1: Retrospective data analysis (coordinators: J Alheit/ T Baumgartner)

- Will organise a meeting on Long-term Dynamics of Small Pelagic Fish and Zooplankton in Japanese waters, 9-12 December 2003, as introduced under Focus 1.
- Will support a new paleoceanographic research activity to be initiated in the Humboldt (Peru), (also reported above under Focus 1), which has the potential to provide comparative data to answer SPACC questions.

Theme 2: Comparative Population Dynamics (Coordinator: M. Barange)

- Completed the activities of a Study Group on “Use of environmental data in the management of pelagic fish” (funded by IOC). Outputs: Two GLOBEC Reports (Special Contributions 5 and 6), eight research papers in the primary literature and one database of environmental data for the four main upwelling areas.

Theme 3: Spawning habitat dynamics (Coordinator: C Roy, D Checkley, L Castro)

- Currently planning a Workshop on “Characterising and comparing spawning habitats of small pelagic fish” (Conveners: L Castro, C van der Lingen and D Checkley) for 12-13 January 2004.
- Also planning a meeting on “Spawning habitat quality and dynamics and the daily egg production method”, for 14-16 January 2004 (Conveners L Castro, C van der Lingen and P Freon). Both meetings are to take place in Concepción, Chile. Funding is limited to local sources, with possible support from IRD and SCOR.

Theme 4: Economic Consequences of pelagic fish fluctuations (Coordinator: S Herrick and J Hunter)

- Planning a workshop on economic and social consequences of climate change on small pelagic fish. (Conveners: S. Herrick/ R Hannesson). Dates and venue for this workshop are still to be finalised, but is likely to take place in 2004. About 50% of the funding required has been identified and we are currently searching for additional support.

Finally, the following programme news must be reported:

- The SPACC Executive Committee will have a planning meeting to facilitate integration activities, in Concepción, Chile, January 2004.
- SPACC scientists are developing a research proposal in the Humboldt Current by French, Peruvian, Chilean scientists, focused on hydrodynamic modelling, fish behaviour and the causes of regime shifts.
- SPACC has been very successful in implementing Eastern Boundary Current hydrodynamic models. Benguela, California and Humboldt hydrodynamic models are available with regional configuration based on the same tool (ROMS). The implementation of a fourth region (Canary Current) will commence in September.
- The Trinational (Canada, USA, Mexico) sardine forum continues its activities, aimed at sustaining collaborative work on sardine in the three countries.

2.3 Southern Ocean GLOBEC

The primary objective of SO GLOBEC is to understand the physical and biological factors that contribute to enhanced Antarctic krill growth, reproduction, recruitment and survivorship throughout the year. Its focus also includes the predators and competitors of Antarctic krill, such as seal, penguins, whales, fish, seabirds and other zooplankton. The field programme includes:

- The Australian programme conducted near 70 E.
- The German programme, focused in the West Antarctic Peninsula and Lazarev Sea. A new phase of this activity will start 2004-2007 in the Lazarev Sea, if funding is approved (to be requested soon).
- The U.S. programme conducted research around the West Antarctic Peninsula, which has completed its field work and is planning its synthesis.
- The British programme, centred in the west Antarctic Peninsula and Scotia Sea. As part of their activities they will deploy new current meters in South Georgia, providing flow fields in another area of SO GLOBEC activity.
- The Korean program, particularly near the Bransfield Strait.

The research highlights of the recently completed U.S. SO GLOBEC fieldwork are as follows:

- The three mooring deployment/recovery cruises, the most recent in Feb-March 2003, which has provided the first long-term record of current measurements in Antarctic coastal waters.
- The process and survey cruises conducted in April-May 2001 and 2002, and in August-September 2001 and 2002, bringing up the total of cruises to eleven in two years.
- The passive acoustic mooring programme which has provided medium- to long-term records of cetacean calls. Results of these programme revealed:
 - A) Blue whales were recorded year-round in the Southern Ocean, although the animals were not visible to observers: is this an adaptation of the previously heavily exploited blue whale to avoid humans, or the result of a single whale stranded in the area for a whole year?
 - B) Recordings of sei whales obtained for the first time.
 - C) Recordings of unidentified whales collected, which appear to be from minke whales, although it is believed that they do not produce sound.

Cruise reports for all cruises are available, as well as a poster describing field activities, from the SO GLOBEC Office (www.ccpo.odu.edu). SO GLOBEC published a special issue of *Oceanography* magazine last year and is planning special sessions at national and international meetings (e.g., IUGG). The first volume of SO GLOBEC research is to be published in *Deep Sea Research* in 2004. 22 manuscripts have been submitted and will be edited by E Hofmann, P Wiebe, D Costa and J Torres.

As part of the follow-on activities:

- The U.S. NSF Office of Polar Programs will issue a special announcement for SO GLOBEC synthesis and modelling activities, due in late 2003.
- Planning for a follow-on program to SO GLOBEC has started. The new programme will be named ICCED – Integrated analysis of Circumpolar Climate interactions and Ecosystem Dynamics in the Southern Ocean – and it may be an activity co-sponsored by IMBER and GLOBEC. It will be circumpolar and interdisciplinary, aiming to understand climate interactions in the SO and implications for ecosystem function and feedbacks to biogeochemical cycles. Its focus will include cetaceans. The International Whaling Commission (IWC) will remain a full partner.

2.4. PICES-GLOBEC Climate Change and Carrying Capacity (CCCC)

CCCC is moving into its “synthesis phase”. An Integration Workshop was held in Qingdao, October 2002 to this effect, to:

1. integrate research activities on:
 - comparisons of coastal ecosystems around the N. Pacific and N. Atlantic rim, with focus on zooplankton and small pelagic fishes;
 - latitudinal comparison of North Pacific ecosystems; and
 - linkages between open-ocean and coastal ecosystems (with focus on salmon)
2. establish a planning team to evaluate and consider possible scientific directions, hypotheses, and experiments for PICES CCCC modelling activities
3. continue monitoring activities through the MONITOR Task Team:
 - CPR time-series collection; and
 - develop a protocol for contributing information to a “State of the North Pacific Ecosystem Status Report”.

These efforts are leading to a major symposium on CCCC Synthesis in 2005/6

The CCCC Session at PICES XII (Oct. 2004) has the title of “CCCC, GLOBEC, and GLOBEC-like results: First steps toward synthesis of the impacts of large-scale climate change on North Pacific marine ecosystems”. Planning will soon begin to identify a successor-program to CCCC.

2.5. New Regional Programme: CLIOTOP (CLimate Impacts on Oceanic TOp Predators)

CLIOTOP is currently under planning. The objective is to organize a large-scale worldwide comparative effort aimed at identifying and elucidating the key processes involved in ecosystem functioning. In particular, it is envisaged to determine the impact of climate variability at various scales on the structure and function of open-ocean pelagic ecosystems and their top predator species. The first planning meeting of CLIOTOP will take place in Sete, France on 3-7 November 2003, to draft a science plan for submission to the GLOBEC SSC. Initial discussions on the Science Plan indicate that CLIOTOP may have four Foci:

- Focus 1- How climate variability affects biology of tuna and other top predator oceanic species at an individual level
- Focus 2- How climate variability affects population dynamics of tuna and other top predator oceanic species
- Focus 3- How climate variability affects pelagic ecosystems
- Focus 4- How to integrate climate and environmental variability in the modelling of oceanic top predator populations and ecosystems

CLIOTOP builds on an existing GLOBEC programme on large pelagic fish in the equatorial Pacific entitled “Oceanic Fisheries and Climate Change Project” (OFCCP). The objective of OFCCP is to investigate the effect of climate change on the productivity and distribution of oceanic tuna stocks and fisheries in the Pacific Ocean with the goal of predicting short- to long-term changes and impacts related to climate variability and global warming.

The OFCCP partnership involves regional organisations (SPC, IATTC) and national institutes (CSIRO [Australia], NIWA [New Zealand], Univ. Hawaii, Univ. Maryland, Univ. Maine, NMFS Hawaii [USA], IPSL [France], NRIFSF [Japan], and Univ. Tokyo [Japan]). It has four components:

1. Monitoring the upper trophic levels of the pelagic ecosystems. Recent activities include:
 - Archival tagging by CSIRO (South Western Pacific), SPC (Western and Central Pacific), Univ. Hawaii (Hawaii), Hawaii NMFS (Central and North Pacific), IATTC (eastern Pacific), and NRIFSF North Pacific (Japan-Kuroshio);
 - Development of a new observation system for monitoring the upper trophic levels of the pelagic ecosystem (Dagorn L., Holland K.). This project is funded by the PFRP Hawaii (400,000 USD); and
 - Acoustic surveys (New Zealand, Australia).
2. Food-web structure in pelagic ecosystems. A new 3-year project on this component has recently been approved by SPC GEF + PFRP (414,000 USD) on trophic structure and tuna movement in the cold tongue-warm pool pelagic ecosystem of the equatorial Pacific. (Allain V., Olson R., Galvan Magaña F., Popp B., Fry B.). The first meeting of the 4 PIs was organised in July 2002 in Honolulu and a second meeting funded by the project was organised in Noumea (SPC) in April 2003.
3. Modelling from ocean basin to individual scale. A project is currently underway on “Mixed-resolution models for investigating individual to population spatial dynamics of large pelagics” (Lehodey P., Kirby D., McClatchie S., Murtugudde R., Dagorn L., Holland K., Polovina J., Sibert J.). This project is funded by the PFRP Hawaii.
4. Socio-economical impacts. Efforts initiated by GLOBEC Focus 4 continue, with the aim of coupling SEPODYM (a physical-biological model) with an economical model (in collaboration with U. Chakravorty), and considering the impact of regime shift at a generational time scale (with R. Sumaila).

2.6. New Regional Programme: Ecosystem Studies of Sub-Arctic Seas (ESSAS)

Following a presentation to the GLOBEC SSC by G Hunt in 2002, GLOBEC undertook to plan a series of meetings to develop a Science Plan of a programme on Sub-Arctic Ecosystems that could fit under the GLOBEC umbrella. The first planning meeting was held in Bergen (Norway) in May 2003, with financial support of SCOR-NSF and the Norwegian Research Council. Attendees to the meeting included S Astthorsson (Iceland), F Carlotti (France), K Drinkwater (Canada), H-J Hirche (Germany), G Hunt (USA), M Kashiwai (Japan), S Kristiansen (Norway), M Kingsley (Greenland), A Krovnin (Russia), H Loeng (Norway), B Megrey (USA), F Mehlum (Norway), S Moore (USA), G Ottersen (Norway), K Richardson (Denmark), V Ozhigin (Russia) and Y Sakurai (Japan).

At the meeting the goal of ESSAS was established as: “*to compare, quantify, and predict the impact of climate variability on the productivity and sustainability of sub-arctic marine ecosystems*”. The following Cross-cutting Hypotheses were formulated:

- Forcing mechanisms and biological processes controlling energy flow are similar across all of the sub-arctic seas. Lessons learned in one system can be transferred to other areas.
- Temperature influences the direction on energy flow within the pelagic/benthic subcomponents of the ecosystem.
- (Changes in) Physical and anthropogenic forcing mechanisms influence the relative importance of top-down vs. bottom-up control of energy flow in the ecosystem.

The Science Plan was outlined according to four major themes. Questions under each theme were identified, and the authors to contribute to the drafting were selected. The themes are:

- Theme 1: How do large-, regional- and local-scale atmospheric patterns cascade into spatio-temporal changes in the ocean physics that are important for ecosystem dynamics in the sub-arctic seas?
- Theme 2: What are the mechanisms that link physical forcing to biological processes and their spatial and temporal scales of interaction?
- Theme 3: To what extent do biological processes regulate the structure, energy flow, and dynamics of the food webs in sub-arctic ecosystems?
- Theme 4: What are the societal and economic impacts of climate variability on sub-arctic marine ecosystems and the feedbacks from changes in ecosystem use on these impacts?

A second planning meeting will take place in Seattle, October 2003, with a view of circulating a draft science plan to the GLOBEC SSC in May 2004.

2.7 New National Programmes

The main GLOBEC activity in Norway (entitled “Mare Cognitum”) came to an end recently. Scientists from the Institute of Marine Research, the University of Bergen, the University of Oslo, the Bjerknes Centre of Excellence, the Nansen Environmental and Remote Sensing Centre and the Ålesund University College have submitted three new national projects to be considered as Norwegian contributions to GLOBEC. These are ECOBE (Effects of North Atlantic Climate Variability on the Barents Sea

Ecosystem), CLIMAR (Climate and Production of Marine Resources) and ADAPT (Adaption to the Ecosystem: Co-evolution of Life History of *Calanus* and Herring in the Norwegian Sea). For a complete list of national activities see Appendix 1.

3. GLOBEC and the SCOR-IGBP IMBER Project

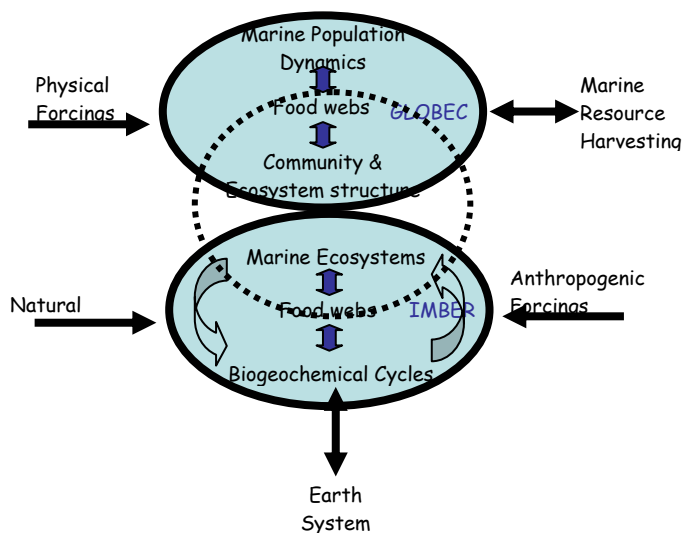
During the last years of JGOFS its co-sponsors, SCOR and IGBP, initiated planning activities to develop a new international research approach on marine biogeochemistry. GLOBEC has actively participated in these activities, from the initial “Future of Marine Biogeochemistry” meeting (Plymouth, UK, September 2000), which the GLOBEC IPO assisted in organising.

GLOBEC’s involvement became particularly important when IGBP and SCOR expressed their wish for the new research programme (IMBER) to work closely with GLOBEC, leading to a merging of activities by 2009 (sunset clause of GLOBEC). This date is now fixed, so that a full integration and synthesis phase for GLOBEC can be planned. This date has also been carefully set so as to honour national, multinational and regional GLOBEC projects (see Appendix 1), whose funding timeline has been in many cases carefully timed to the duration of the international project.

To develop the links between GLOBEC and IMBER the Executive Officer of GLOBEC has been an ex-officio member of the OCEANS Transition Team (TT). The chair of the IMBER TT (J Hall) was invited to address the GLOBEC Open Science Meeting in Qingdao (October 2002), and to participate in the 7th GLOBEC Scientific Steering Committee meeting. Equally, GLOBEC’s Chair (F. Werner’s) was a speaker at the OCEANS OSM and M. St John (GLOBEC Focus 2 member) chaired one of the working group sessions at the OCEANS OSM.

At the IGBP Congress in Banff, Canada during June 2003, the first draft of the IMBER science plan was circulated to the GLOBEC SSC. In order to contribute positively to the development of the Plan the GLOBEC SSC prepared the following response to the IMBER TT:

1. With the conclusion of JGOFS, the SSC of GLOBEC strongly endorses the scientific need for a complementary sister project focussing on biogeochemical cycles in the ocean.
2. We also endorse and support the general thrust of the draft Science Plan and Implementation Strategy for IMBER, but recognise the need to tighten it up in places.
3. Our main concern is that misleading impressions may be given to people not familiar with the sister projects in IGBP-2.



4. The impression may be given that IMBER will cover most aspects of Marine Ecosystems and of Biogeochemical Cycles in the Ocean.
5. We therefore suggest that a section comparing the scope of IMBER with that of GLOBEC (and probably also SOLAS and LOICZ), should be given up front along the lines of the above diagram, and according to the issues described below.
6. GLOBEC is concerned with food webs and community structure, but mainly at the larger end of the size spectrum, whereas IMBER will be concerned with the microbial loop, nutrient cycling, detritus and the smaller end of the size spectrum, and with primary production, along with SOLAS.
7. We recommend that GLOBEC and IMBER form a joint task team with the explicit task of integrating studies, models and understanding of food webs from end-to-end. This would then be a joint responsibility of BOTH PROJECTS, and not either one alone.
8. There should be a clear timeline for the initial IMBER project (e.g., 2004-2008) with a joint GLOBEC/IMBER task team to guide the formation of a new merged project in 2009 or 2010.
9. In conclusion, the GLOBEC SSC looks forward to co-operating with its new sister SSC and project in many joint ventures. At the national level, many countries, including most developing countries, will not be able to afford both GLOBEC and IMBER national programmes, and will have single national programmes addressing both international projects. This is also likely to be the case in polar oceans, where joint programmes including both IMBER and GLOBEC scientists will be the norm. The GLOBEC SSC looks forward to synthesis and completion of GLOBEC by 2009 and will work, through a joint task team, towards a merged project thereafter.

4. GLOBEC IPO

The GLOBEC IPO's is co-sponsored by the Plymouth Marine Laboratory and the Natural Environment Research Council of the UK. Funding is secured until March 2005. NERC has been informed that GLOBEC would like to initiate a process of evaluation of the activities of the programme, leading to an extension of the current grant beyond 2005. While there has been no response to date, NERC has announced a new funding stream dedicated to Earth System Science and international project office support.

GLOBEC Funding 2003[@]	US \$	Objective
UK -NERC	124,957	IPO support (until March 2005)
PML	41,652	In-kind support (until March 2005)
IGBP Contribution to SSC 2003	19,000	SSC activities (annual)
NSF-SCOR	85,000	Programme activities (annual)
	7,000	For travel of developing country scientists
IOC (through SCOR)	10,000	SSC activities (annual)
NOAA (through SCOR)	24,555	For OSM <i>Fisheries Oceanography</i> issue
NSF-ESSAS (through SCOR)	88,500	Development of ESSAS programme
Norwegian Research Council	15,000	Development of ESSAS programme
TOTAL	\$415,664	

@ not including national programmes or funds not raised/managed from outside the IPO

SCOR is thanked for its support to GLOBEC activities.

5. GLOBEC SSC 2003

The membership of the GLOBEC SSC is shown in the table below.

Name	Gender	Country	Function	Term end
Dr Jürgen Alheit	M	Germany	Chair Focus 1, SPACC Exec	(Ex-Officio)
Dr Tim Baumgartner	M	Mexico	SSC, Focus 1, SPACC Exec	2 nd term 2004
Prof John Field	M	South Africa	SSC	1 st term 2004
Dr Roger Harris	M	UK	SSC Past-Chair, Focus 2	(Ex-Officio)
Prof Eileen Hofmann	F	USA	SSC, SO Chair	(Ex-Officio)
Dr Patrick Lehodey	M	New Caledonia	SSC, Focus 4	2 nd term 2005
Dr Celia Marrase	F	Spain	SSC, Focus 3	2 nd term 2004
Prof Rosemary Ommer	F	Canada	SSC, Focus 4 co-Chair	2 nd term 2005
Dr Geir Ottersen	M	Norway	SSC, CCC Co-Chair	2 nd term 2005
Dr Ana Parma	F	Argentina	SSC	1 st term 2004
Dr Ian Perry	M	Canada	Focus 4 co-Chair	(Ex-Officio)
Dr David Runge	M	USA	SSC	1 st term 2005
Prof Qisheng Tang	M	China	SSC	1 st term 2005
Prof Francisco Werner	M	USA	SSC Chair, Focus 3	1 st term as Chair 2005

GLOBEC has reduced the size of its core membership of the SSC (not of the larger SSC) to add some flexibility during early implementation of IGBP Phase II, and to ensure representation of key regional programmes and Foci working groups in the deliberations of the SSC.

6. CALENDAR OF ACTIVITIES (May 2003-May 2004)

- 25-26 June 2003: GLOBEC Focus 4 Working Group Meeting, Banff, Canada
- 15-19 September 2003: SCOR Executive Committee, Moscow, Russia
- 24-27 September 2003: ICES ASC, Tallinn, Estonia (GLOBEC-CCC Session)
- 10-18 October 2003: PICES XII, Seoul, Korea (GLOBEC Focus 4 and CCCC sessions)
- 16-18 October 2003: IHDP Open Science Meeting, Montreal, Canada (GLOBEC Focus 4 session)
- 22-25 October 2004: IOC/SCOR Basin-Scale Ecosystem Model workshop, Harlow, UK
- 31 October- 1 November 2003: 2nd GLOBEC-ESSAS planning meeting, Seattle, USA
- 4-7 November 2003: GLOBEC-CLIOTOP planning meeting, Sete, France
- 9-12 December 2003: SPACC workshop on Long-term Dynamics of Small Pelagic Fish and Zooplankton in Japanese waters, Tokyo, Japan
- 12-14 January 2004: SPACC meeting on spawning habitats of small pelagic fish, Concepción, Chile

- 15-16 January 2004: SPACC meeting on spawning habitat and the DEPM. Concepción, Chile.
- 17-18 January 2004: SPACC Executive committee meeting. Concepción, Chile.
- February 2004: GLOBEC Focus 1 WG meeting. TBA
- 26 February 2004: UK-GLOBEC Open Meeting, London, UK
- 1-5 March 2004: SC-IGBP meeting. St Petersburg, Russia.
- 31 March - 3 April 2004: IOC-SCOR Symposium on “Quantitative Ecosystem Indicators.” Paris, France
- 2-6 May 2004: 4th World Fisheries Congress. Vancouver, Canada.
- 7-10 May 2004: CCC working group meeting. Bergen, Norway.
- 11-14 May 2004: ICES-GLOBEC Symposium on “The Influence of Climate Change on North Atlantic Fish Stocks.” Bergen
- April/May 2004. GLOBEC SSC meeting

Meetings for Focus 2, Focus 3 and Focus 4 WG for 2004 have not yet been finalised.

Appendix1. GLOBEC National, Multinational and Regional Programmes (Note: This is constantly evolving)

NATIONAL GLOBEC PROGRAMMES					
Country	Duration	Name-code	Funding	Contact	Nature of Prog.
Brazil	1998-2002	DEPROAS	Conselho Nacional de Desenvolvimento Cientifico e Tecnologico	Y. Matsuura	3
Canada	1996-1999	GLOBEC Canada	Natural Sciences and Engineering Research Council Fisheries and Oceans Canada	B. de Young	1
Chile	1997-	FONDAP-Humboldt	Chilean National Commission for Science and Technology	R. Escribano	3
China-Beijing	1997-	China GLOBEC	National Natural Science Foundation of China Ministry of Science and Technology	Q. Tang	1
France	1999-	PNEC	Call for proposals, funded for 1 year. Proposals can be resubmitted each year. Mean duration ~4 years.	F. Carlotti	4
Germany	2000-	GLOBEC Germany	Waiting for funding to be approved by Federal Ministry for Education, Science, Research and Technology plus participating institutions	J. Alheit	1
Italy	2000-	SINAPSI	Ministero dell’Universita’ e della Ricerca Scientifica e Tecnologica	M. Zavatarelli	
Japan	1997-	Japan GLOBEC	One project funded by Japanese Government, others seem to be institute/university funded	T. Sugimoto	4

Mexico	1997-	IMECOCAL	Consejo Nacional de Ciencia y Tecnológica IAI	T. Baumgartner	3
Netherlands	1993-	Several	Various loosely affiliated projects, various funding agencies	G Fransz	4
Norway	2002-2005	ECOBEC, CLIMAR, ADAPT	EU funding, Norwegian Research Council, Norwegian Institutes and Institute of Marine Research	W. Melle/ S. Sundby	2
Portugal	1999-	GLOBEC Portugal	Portuguese Foundation for Science and Technology, IPIMAR	M. Santos	4
Spain	2001-	GLOBEC Spain	Ministerio de Ciencia, IEO, CSIC	C. Marrase	4
Turkey	1997-	Black Sea GLOBEC		T. Oguz	3
Ukraine	1997-	Ukraine GLOBEC	INTAS, UK DETR Darwin Initiative + others	V. Zaika	4
UK	2000-2005	Marine Productivity (largest)	NERC Thematic money – individual projects by proposal	P. Williamson	1
USA	1994-	US GLOBEC	NSF and NOAA – individual projects by submitted proposals	M. Fogarty	1
MULTI-NATIONAL GLOBEC PROGRAMMES					
Name-Code	Duration	Countries	Funding	Contact	Nature of prog.
BENEFIT	1997-	South Africa, Namibia, Angola, Norway, Germany	Norwegian and German donor agencies, Governments of Angola, Namibia, South Africa	N. Sweijd	1
LIFECO	2000-2003	Norway, Germany, UK, Denmark	EU FP 5	M. St John	3
TASC	1996-1999	Norway, UK, Denmark, Iceland, Germany, France, ICES	EU MAST	K. Tande	3
ENVIFISH	1999-2001	EU countries, Angola, Namibia, South Africa	EU INCO	L. Nikjaer	3
VIBES	1997-2000	France, South Africa	ORSTOM	P. Freon	3
IDYLE	2001-	France, South Africa	ORSTOM	P. Freon	3
NATFISH	2002-	Norway, Morocco, Mauritania, Senegal, Italy	EU INCO	L. Nikjaer	3
OFCCP	2001-	USA, New Caledonia, Mexico, Australia, France,	National Funding agencies of participating countries, GEF.	P. Lehodey	3

		New Zealand, Japan, IATTC			
REGIONAL PROGRAMMES					
Name-Code	Start Year	Countries	Funding	Contact	Nature of prog.
SPACC	1993-	Spain, France, Germany, Japan, Chile, Peru, Senegal Mauritania, Portugal USA, Mexico, and others	National	D. Checkley, C. Roy	4
ICES-CCC	1993-	ICES countries	National, ICES	K. Drinkwater, G. Ottersen	4
PICES- CCCC		Japan, China, Korea Russia, Canada, USA	National, PICES	M. Kashiwai, H. Batchelder	4
SO		USA, Australia, UK Germany, IWC, and others.	National	E. Hofmann	1, 4

- 1- Specific GLOBEC call by national funding agencies, for individual scientists to bid against.
- 2- As for (1), but only affiliated to GLOBEC after funding has been allocated
- 3- Single project affiliated to GLOBEC post-funding (often with many PIs)
- 4- Group of relevant, independent projects under national funding, affiliated to GLOBEC as a group

Annex 11 – Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB)
Programme Report

GEOHAB Activities 2002-2003

I - Meetings and activities

The GEOHAB Scientific Steering Committee (SSC) met in plenary in La Rochelle, France on 4-7 December 2002 to finalise the structure of the *GEOHAB Implementation Plan*. The editorial committee met 18-21 February 2003 in Copenhagen, Denmark to finish preparing the plan for review.

The chairman attended the EU-U.S. workshop on Harmful Algal Blooms in Trieste (Italy) 4-9 September 2002 to promote GEOHAB as an umbrella for these activities. He was invited to Ottawa, Canada on 22-27 August 2002 by the Canadian Department of Fisheries and Oceans to contribute to the development of a network of excellence on harmful algal blooms (HABs) in Canada. The chairman was also invited to the Gordon Research Conference on “Coastal Ocean Modeling” in June 2003 as an invited speaker, which helped in drawing the attention of physicists to the exciting problems and challenges raised by HAB population dynamics, especially at the small scale (i.e., the viscous range). The GEOHAB SSC will build on this foundation to establish durable co-operation with some physical modellers.

A workshop on the definition of real-time observing systems for ecosystem dynamics and harmful algal blooms, sponsored by EU-EC, ESA, CNRS, IFREMER and ONR, NSF, NOAA, and endorsed by SCOR, IOC, ICES and PNEC, was held in Villefranche sur Mer, France on 11-21 June 2003. The workshop gathered 87 participants. The proceedings will be on line at the Web site: <http://www.HABWATCH.org>.

The four Core Research Projects defined by the SSC have not benefited from a sufficient input from the scientific community, contrary to other programs developed in the past. The next step is therefore to hold a series of four Open Science Meetings before the end of 2004 on the following topics: Upwelling, Fjords and Coastal Embayments, Semi-Confined Areas and Stratified Environments.

An Open Science meeting is planned in Lisbon, Portugal (17-20 November 2003) in order to draw a detailed action plan on the “Upwelling” Core Research Project. The three other Core Research Projects are planned for 2004. The actions plans for “Fjords and Coastal Embayments” and “Semi-confined zones” will be detailed in the first semester of 2004 while the one on “Stratified Environments” is planned for late 2004.

The GEOHAB SSC benefits from other groups' activities, such as the

- IOC-ICES Working Group on Harmful Algal Blooms Dynamics
- ICES Working Group on Modelling Physical-Biological Interactions
- ICES Study Group on the Implementation of GEOHAB in the Baltic Sea

II - Implementation Plan

The *Implementation Plan* for GEOHAB has been submitted to SCOR and IOC and has been revised according to the comments of eight external reviewers. The major question concerned data management from the different Core Research projects. To answer that question, the SSC relied on advice from more experienced SSC members on this topic and presented a revised version of the *GEOHAB Implementation Plan*, which is downloadable from the GEOHAB Web site.

For the purposes of implementation, the GEOHAB SSC has adopted a three-category system for defining and endorsing GEOHAB research:

1. Core Research is comparative, interdisciplinary, international, and directly addresses the overall goals of GEOHAB as outlined in the *GEOHAB Science Plan*. Core Research will directly address Programme Element 4 on Comparative Ecosystems and thus will cross-cut the other Programme Elements.

A major objective of Core Research is the integration achieved by the application of coupled biological/chemical/physical models to HAB dynamics in geographically distinct ecosystems sharing common features. Modelling activities within Core Research Projects may include the application of specified models to different ecosystems, testing and validation of different models within given ecosystems, and modification of existing models to fit current, emerging or hypothetical data sets. The extent to which HAB species respond in a similar way in ecosystems with similar characteristics will assist in defining the oceanographic processes that influence their population dynamics and community interactions. Interpreted via models, this comparative approach is ultimately expected to lead to an enhanced capability for HAB prediction.

2. Targeted Research addresses specific objectives outlined in the *GEOHAB Science Plan*. Targeted Research may be solicited by the SSC as the need arises from Core Research Projects. Targeted research differs from Core Research in scope and scale. Whereas Core Research must be comparative, integrative and multi-faceted, Targeted Research activities may be more tightly focussed and directed to a research issue or element. It is expected that such studies of specific processes and mechanisms will facilitate the wider and larger-scale Core Research studies. For example, investigations on specific methods for model comparisons and intercalibration are targeted activities, valuable in their own right, yet are also essential to conduct comprehensive field studies and modelling in Core Research Projects.

3. Regional/National Research includes activities relevant to the objectives of the *GEOHAB Science Plan*, but may have other overall objectives. Regional/National research is co-ordinated at a regional or national level rather than by the SSC, but can apply for endorsement from GEOHAB.

Examples include

- GEOHAB-Canada has been endorsed formally as a national research activity
- A regional study on ciguatera has also been endorsed
- GEOHAB (GEOHAB-China) was endorsed in 2001.

To be endorsed by GEOHAB, Regional/National Research activities must share objectives with GEOHAB in furthering the understanding of the ecological and oceanographic mechanisms underlying HAB population dynamics. As an example, toxin production will be studied if it directly influences population dynamics, for example, by grazing inhibition. Thus, phytoplankton and toxin monitoring *per se*, or research on toxicity, human health, and environmental impacts, are not endorsable as GEOHAB activities, but research projects aimed at understanding factors leading to HABs may be. Although HAB monitoring will not be endorsed by GEOHAB, the programme will seek to use data from national and international monitoring programmes in conjunction with Core Research Projects, modelling, and other activities. While the GEOHAB SSC is not directly responsible for co-ordination or implementation of Regional/National Research activities, it can provide advice on aspects of National Programmes that can advance GEOHAB's goals. The GEOHAB SSC will compile a register of monitoring programmes in a metadata base. The SSC will assist in linking relevant aspects of national plans with GEOHAB-related research in other regions of the world.

GEOHAB Finances

Income	2002	2003	2004
Carry-over from previous year		\$1,960.00	\$18,231.14
NOAA (through SCOR)	\$4,801.76	\$0.00	\$20,000.00
NSF (through SCOR)	\$20,000.00	\$30,000.00	\$30,000.00
SCOR Support for LDC Travel		\$5,000.00	
FLAD		\$1,400.00	
IFREMER	\$15,027.00	\$6,933.00	
Registration Fees		\$7,500.00	\$22,500.00
IOC	\$14,050.00	\$20,000.00	\$20,000.00
Total	\$53,878.76	\$72,793.00	\$110,731.14
Expenses			
Publications		\$10,000.00	
SCOR Administrative Expenses	\$1,726.55	\$50.42	
Subcommittees	\$3,455.36		
Other Meetings	\$6,776.57	\$427.44	

SSC Meeting 1 IOC	\$14,050.00		
SSC Meeting 1	\$1,207.44		\$25,000.00
SSC Meeting 2 (SCOR and IOC)	\$19,387.84		
SSC support and HABWATCH meeting	\$5,315.00		
Editorial Committee		\$6,933.00	
HABs in Upwelling Systems		\$37,151.00	
HABs in Fjords and Coastal Embayments			\$30,000.00
HABs in Stratified Systems			\$30,000.00
HABs in Eutrophified Systems			\$30,000.00
Total	\$51,918.76	\$54,561.86	\$115,000.00
Remaining	\$1,960.00	\$18,231.14	-\$4,268.86

Annex 12 – Surface Ocean – Lower Atmosphere Study (SOLAS) Report

SOLAS REPORT TO SCOR 2002/2003

SOLAS Science Plan and Implementation Strategy

A draft version of the SOLAS *Science Plan and Implementation Strategy* is now available for download from the SOLAS Web site (www.solas-int.org). The implementation sections, and the whole of Focus 2, are currently being reviewed and it is hoped that a final, hard copy version will be available by the end of the year. Progress on the SP and IS was largely achieved by the concerted efforts of the SSC at their second meeting, in Gif-sur-Yvette, France in Nov 2002. A smaller writing group met in Norwich in Feb. 2003 to complete some sections and began the editorial work. Editing continued in Norwich until the draft was made available on the web in April.

SOLAS National Activity

National SOLAS programmes continued to gather pace throughout the year. The Canadian SOLAS programme (\$9M over 5 years) got in the water with a successful cruise in the NW Pacific (Subarctic Ecosystem Response to Iron Enrichment Study, SERIES) and has just completed the first of three north-west Atlantic cruises studying seasonal variations in climatically active gas fluxes.

In the UK, the Natural Environment Research Council recently approved an £11M, 6-year thematic programme called UK SOLAS. The programme includes funding for the SOLAS International Project Office for 5 years.

The Japanese SOLAS-related programmes, namely, the Sub-arctic ocean Enrichment and Ecosystem Dynamics Study (SEEDS), Studies on the Antarctic Ocean and Global Environment (STAGE), the Subtropical Nitrogen Fixation Flux Study (SNIFFS), and the Variability of Marine Aerosol Properties (VMAP) project, are all going well and discussions on a future Japan-SOLAS programme are underway.

The German *Meteor 55* cruise marked the entry of Germany into international SOLAS efforts. It was successful in bringing together marine chemists, atmospheric chemists and biologists from several countries to work collaboratively on trace gas, trace metal and nitrogen ocean-atmosphere cycling.

In China (Beijing), the China National Committee for IGBP (CNC-IGBP) has established a SOLAS working group. The National Natural Science Foundation of China (NSFC) decided to support China SOLAS with a budget of 8 Million RMB (about one million US dollars) for the next 4 years. Planning for a regional programme involving researchers in China, Korea and Japan is under way.

Attempts to secure EU funding for an EU-SOLAS project continue, but so far unsuccessfully. SOLAS crosscuts many of the topics outlined in the first two calls of Framework VI, but there does not seem to be an institutional framework that would support a SOLAS-type of proposal. The possibility of a EUROCORES programme is being pursued.

SOLAS Communication

To coincide with the launch of the SP and IS, the SOLAS Web site was redesigned and expanded. It now contains more information about national programmes and is considerably more interactive with opportunities for researchers to submit their research for SOLAS endorsement, advertise for collaborators and publicise upcoming cruises.

The SOLAS mailing list has expanded to include over six hundred members.

SOLAS science has been presented at the EGS-AGU-EUG Joint Assembly, the JGOFS OSC, the CLIVAR SSG, the WCRP JSC, SC-IGBP and IUGG Japan.

Interactions with other projects

A WCRP working group on surface fluxes is to be developed, with SOLAS playing a significant role from its inception.

SOLAS interactions with its IGBP sister projects (IGAC and iLEAPS in the atmosphere, LOICZ, IMBER, and GLOBEC in the ocean) will be addressed at two sessions of the IGBP Congress in June. The results of these sessions will be made available on the SOLAS Web site. IGAC and SOLAS are also due to consider the role of the proposed Air-Ice Chemical Interactions (AICI) task at the Congress.

Future Activity

2003 promises to be a busy year for SOLAS. The UK NERC money will allow a full IPO to be established and this will dramatically enhance the ability of SOLAS to coordinate international research. Allied to this, funding is being secured for meetings of the SOLAS working groups which will oversee the implementation of the SOLAS SP and IS.

The working groups will be constituted at the third SSC meeting, to be held in June in Banff Canada. They are:

- Focus 1 WG: Biogeochemical Interactions and Feedbacks Between Ocean and Atmosphere
- Focus 2 WG: Exchange Processes at the Air-Sea Interface and the Role of Transport and Transformation in the Atmospheric and Oceanic Boundary Layers
- Focus 3 WG: Air-Sea Flux of CO₂ and Other Long-Lived Radiatively Active Gases
- WG on Data and Model Management

It is envisaged that several of these groups will meet before the end of this year.

SOLAS Science 2004, the first international symposium to present the progress of SOLAS, will be held in Halifax, Nova Scotia, Canada on 10-14 Oct. 2004. It is being organised by the Canadian SOLAS office.

The SOLAS Summer School will run on 30 June-11 July 2003 at the Institut d'Etudes Scientifiques de Cargèse Université de Corse, in Corsica, France. It was heavily oversubscribed with 233 applications, most of very high quality, and 72 SOLAS researchers have been accepted to the course. Nearly a third of

these are from developing countries and a large proportion of all the students will receive financial assistance.

Casey Ryan,
May 2002

	2002	2003	2004
Income			
SCOR - NSF	\$30,000	\$35,833	\$55,000
SCOR - Carryover from Previous Year	\$45,477	\$41,628	\$14,461
IGBP	\$20,000	\$19,000	\$20,000
IGBP Carryover	\$5,839		
ICSU	\$40,000		
Total	\$141,316	\$96,461	\$89,461
Expenses			
PSL (phone, admin support, consumables)	\$25,839	\$0	\$0
Exec. Comm./Nat. Reps.	\$49,704	\$0	\$12,000
Publications		\$695	
SSC Meeting	\$12,123	\$21,242	\$15,000
Editorial Meeting		\$3,474	
Participation in other meetings	\$23,000	\$5,178	\$6,750
WG 1 Meeting		\$25,000	\$15,000
WG 2 Meeting	\$5,000	\$0	\$0
WG 3 Meeting		\$25,000	\$25,000
WG 4 Meeting		\$0	\$0
Open Science Meeting			\$15,000
Overhead to SCOR	\$1,500	\$1,500	\$1,500
Adjustment for 2002 expenses		-\$88	
Total	\$117,165	\$82,000	\$90,250
Remaining Balance	\$41,628	\$14,461	-\$789

Annex 13 – Integrated Marine Biogeochemistry and Ecosystems Research (IMBER) Report

IMBER: Integrated Marine Biogeochemistry and Ecosystem Research (previously OCEANS)

Report 2002/2003

Submitted by
Dr. Julie Hall, IMBER Chair
on behalf of the IMBER Transition Team.

Contents

New Name
Transition Team meetings
Science focus of IMBER
Linkages with other projects and programmes
Way forward and timeline
Funding
Acknowledgements

New Name

At the request of the sponsors (SCOR and IGBP) a new name for the ocean biogeochemistry and ecosystems project (formerly called “OCEANS”) was identified and has been agreed to by both sponsors. The new name is IMBER: Integrated Marine Biogeochemistry and Ecosystem Research.

Transition Team meetings

The IMBER Transition Team has held four meetings and convened a major open science conference since the 2002 SCOR General Meeting:

a) An editorial meeting was held in November 2002 (Bolger Centre, Washington DC, USA) at which the format of the *IMBER Science Plan/Implementation Strategy* was established. In addition, the responsibilities of the Transition Team members at the Open Science Conference were discussed, along with planning for the conference.

b) To assist in the development of the *IMBER Science Plan/Implementation Strategy*, an Open Science Conference was held in Paris, France on 7-10 January 2003. The main aim of the conference was to gather input from the scientific community for the science themes of the new project. The conference started with 15 plenary lectures, which were followed by working group discussions. In addition, there

were two poster sessions with a total of 200 posters presented, the abstracts of which are available on the conference Web site (www.igbp.kva.se/obe/). The conference was attended by 370 participants from 36 countries.

The IMBER Open Science Conference working groups were:

1. Trace elements in ecological and biogeochemical processes
2. Physical forcing of biogeochemical cycling and marine food webs
3. Climatic modulation of organic matter fluxes
4. Direct effects of anthropogenic CO₂ on biogeochemical cycles and ecosystems
5. Integrating food-web dynamics from end to end
6. Continental margins
7. The mesopelagic layer
8. Biogeochemical hotspots, choke points, triggers, switches and non-linear responses
9. Feedbacks to the Earth System
10. Coupled models of biogeochemical cycles and ecosystems

The working groups were asked to identify and prioritise key research questions and what we need to know to answer those questions. They were also asked to identify any promising approaches, emerging technologies and regional considerations. In addition to the working group discussions, short oral reports were given on related current national and international activities and any future plans relevant to the development of the IMBER project. Patrick Holligan (Southampton Oceanography Centre) gave a "Conference Summary" presentation and this summary, the conference programme, abstracts, and final working group reports are all available on the Web site. Input from the IMBER working groups, plenary speakers, comments submitted via the IMBER Web site, along with other material, have been used by the IMBER Transition Team to identify the key science themes and issues which will form the scientific focus of the new project.

c) Before the Open Science Conference, the Transition Team held a one-day meeting dealing with the logistics of the conference. The Transition Team met for two days after the conference to collate and synthesise the scientific input from the working group to formulate the science focus of the IMBER project. The working group reports were integrated to form the initial IMBER Themes and Issues. Several articles about the conference have been provided to GLOBEC, LOICZ and JGOFS for publication in their project newsletters.

d) A second editorial meeting was held in March 2003 (Washington DC, USA) prior to the JGOFS Open Science Meeting. At this meeting the *IMBER Science Plan/Implementation Strategy* outline (Appendix 1) was further refined and initial drafts of the Themes and Issues were prepared for the IGBP Congress in Banff.

e) The IMBER Transition Team met during the IGBP Congress in June 2003 (Banff, Canada). At this meeting, the Transition Team refined the *IMBER Science Plan* and began developing the *Implementation Strategy* for the project. The Transition Team also took this opportunity to meet with the

scientific steering committees of GLOBEC, SOLAS and LOICZ to discuss key implementation issues between the projects.

Science Focus of the IMBER project

The IMBER project focus is biogeochemical cycles, ecosystems and their interactions (Figure 1). The overarching question for the project is

“How do marine ecosystems, biogeochemical cycles and their interactions respond to global change and, in turn, feed back to the Earth System?”

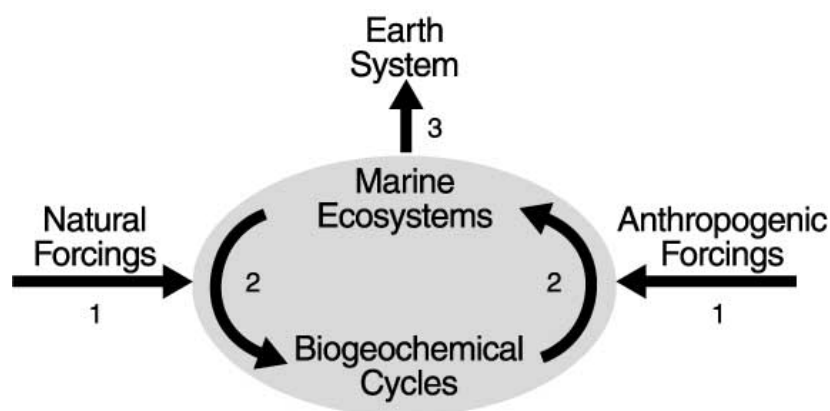


Figure 1: The scientific questions of the IMBER project focus on the impacts of natural climatic and anthropogenic forcings on geochemical cycles and marine ecosystems (arrows 1), with particular focus on how these forcings alter the relationships between elemental cycles and ecosystems (arrows 2) and how these responses feed back to the Earth System (arrow 3).

The Science Plan for IMBER has been divided into three Themes and within each theme, three Issues have been identified. Each Issue has a number of major science questions to provide a focus for the project. The IMBER scientific Themes and Issues are:

- Theme 1: Interactions between marine biogeochemical cycles and ecosystems
 - Issue 1: Sources and sinks in biogeochemical cycles, and macro/micro nutrient stoichiometry
 - Issue 2: Relationships between biodiversity, structure, function and stability of marine ecosystems
 - Issue 3: Role of macro/micro nutrient availability, assimilation and cycling in controlling food-web structure and function
- Theme 2: Sensitivity of ecosystems, biogeochemical cycles and their interaction, to global change
 - Issue 1: The impact of climate-induced changes in circulation, ventilation, and stratification on biogeochemical cycles and ecosystems

- Issue 2: Response of biogeochemical cycles, ecosystems, and their interactions, to increasing anthropogenic CO₂ and changing pH
- Issue 3: Response of biogeochemical cycles, ecosystems, and their interactions, to changes in the fluxes of macro/micro nutrients into the marine environment from land and air
- Theme 3: Feedbacks from biogeochemical cycles and the ecosystem to the Earth System components
- Issue 1: Oceanic regulation of atmospheric CO₂ concentration
- Issue 2: Feedbacks from the biogeochemical cycles and the ecosystem to climate
- Issue 3: Feedbacks to Human Dimensions

Several key domains have been identified for IMBER research, including the euphotic zone, the mesopelagic layer, continental margins, and high-latitude oceans.

The main *Science Plan/Implementation Strategy* sections that have been drafted to date are

- IIb Project Scope,
- III Themes and Issues, and
- V Project Organisation.

Linkages to Other Projects and Programmes

During the IGBP Congress, working group discussions were held with the other marine projects to discuss potential collaborations.

The IMBER Transition Team and GLOBEC SSC recognized the need for close collaboration between the two projects and identified the following options to facilitate that collaboration:

- formation of a joint “end-to-end food webs” task team
- joint endorsement of projects (with the likely outcome that some programmes may get endorsed by both projects)
- formation of a joint long-term planning team, which will develop an implementation strategy for post-2009 research.
- back-to-back SSC meetings
- ex-officio members on both Scientific Steering Committees
- publication of joint newsletters
- co-location of the project IPOs

The IMBER Transition Team and SOLAS SSC recognized that there are important collaborative opportunities between the projects. The key links between IMBER and SOLAS are most likely through SOLAS Foci 1 and 3 (to facilitate collaboration, it was agreed that IMBER will have a representative on the SOLAS working groups 1 and 3). The projects will work towards joint endorsement of projects (as with GLOBEC, the endorsement would be at individual project level and therefore some programmes may be endorsed by both IMBER and SOLAS).

The IMBER Transition Team and LOICZ SSC recognised that although the projects have taken a different approach to their implementation, there must be close collaboration between them in the region of the continental margins. This will be facilitated through the LOICZ Theme 3 and the IMBER Continental Margins working group.

There were very productive side meetings between IMBER Transition Team members and the PAGES Executive Officer Keith Alversen, and with the DIVERSITAS chair Michel Loreau to discuss the collaborative links between the projects. These will be developed further in the coming months.

Howard Cattle (executive officer of CLIVAR) attended part of the IMBER Transition Team meeting to discuss the development of key collaborations between IMBER and CLIVAR, in particular with the CLIVAR ocean basin panels.

Way Forward

The timeline for the remaining development of the *IMBER Science Plan/Implementation Strategy* is to have the Themes and Issues sections completed by July 2003. The remaining sections of the *Science Plan/Implementation Strategy* will be written by September, and a full draft of the *Science Plan/Implementation Strategy* will be available on the project Web site for comment by the scientific community by October 2003. After the integration of the comments, the *Science Plan/Implementation Strategy* will be sent to SCOR and IGBP for review.

The IMBER Transition Team has funds remaining for an editorial meeting in late 2003, if necessary. The IMBER SSC will have adequate funds available for its first meeting, as well as several small meetings designed to work on detailed research plans for IMBER activities. IMBER acknowledges the special contribution by IGBP in 2003 to support local costs in the IMBER Chair's institution for project assistance.

Funding

Income	2002	2003	2004
SCOR – NSF	\$55,000	\$41,667	50000
SCOR Carry-over from Previous Year	\$5,704	\$108,935	\$4,935
IGBP	\$24,868	\$28,500	20000
IGBP (staff support)	\$4,000	\$29,625	
IGBP Ocean Vision	\$2,189		
SCOR		\$16,214	
ICSU	\$50,000		
Registration Fees		\$38,462	
Total Income	\$141,761	\$263,402	\$74,935
Expenses			
2002 Potomac OCEANS Transition Team Meeting	\$23,124		
Representation at GLOBEC, WOCE, LOICZ OSCs	\$3,510		
Ocean Vision meeting	\$2,189		
Open Science Conference in Paris	\$4,003	\$134,389	
TT meeting in Paris		\$26,415	
Side Meeting at JGOFS OSM		\$5,771	
Other SCOR Admin		\$2,806	
NIWA Expenses		\$29,625	
IGBP Congress in Banff		35,794	
SP/IS Editorial Meeting		\$12,000	
2004 SSC Meeting			25000
SSC Executive Committee Meeting			15000
Subgroup Meeting 1			15000
Subgroup Meeting 2			15000
Subgroup Meeting 3			15000
Total Expenses	\$32,826	\$246,800	\$70,000
 Remaining Balance	 \$108,935	 \$16,602	 \$1,602

Acknowledgements

I would like to thank Ed Urban, Wendy Broadgate, Liz Gross, Penny Cooke and the teams from the SCOR and IOC offices for their excellent support in organising the Open Science Conference in Paris. Special thanks must also go to Ed Urban and Wendy Broadgate for their continued support for the project.

Annex 14 – Excerpt on SCOR from ICSU PAA on the Environment in Relation to Sustainable Development

Report of the CSPR Assessment Panel on Environment and its Relation to Sustainable Development

by

Robert Watson (Chairman), Anne Buttimer, Angela Cropper, Istvan Lang, Gordon McBean, James McCarthy, Uri Shamir, Crispin Tickell, Shem Wandiga

December 2003

(Excerpt from pages 24-25)

5.3 Thematic organizations

5.3.1 Scientific Committee on Oceanic Research (SCOR)

SCOR was founded in 1957 to further international scientific activity in all branches of oceanic research. It was one of the first IBs of ICSU, and every oceanographer is familiar with at least some of SCOR's impressive list of accomplishments. This organization has a rich history of successes with working groups that have vetted methods of sample collection and analysis, and brainstormed topics for future research. Well known is the reputation of SCOR for its extensive outreach to scientists, laboratories, and research organizations in the developing world. Over the last 45 years, many developed country oceanographers made their first contacts with developing country scientists through SCOR meetings and reports. Prior to its first major programmatic accomplishment - the Indian Ocean Expedition in the early 1960s - major oceanographic expeditions were largely the works of individual nations or individual laboratories. SCOR, more than any other organization, is responsible for the widespread international cooperation that is characteristic of modern ocean science. In view of the successes of the GEC programmes (e.g. IGBP and WCRP) in the 1990s, the advent of the Internet and virtual meetings, one could ask "does SCOR still have a role to play?" SCOR sponsorship remains still the best way to bring oceanographers of all disciplines to the table. The development of ocean projects within the GEC programmes was considerably facilitated by the work of SCOR. The roots of the international underpinnings of Tropical Ocean and Global Atmosphere (TOGA), World Ocean Circulation Experiment (WOCE), Joint Global Ocean Flux Study (JGOFS), and Global Ocean Ecosystem Dynamics (GLOBEC) can be traced to SCOR initiatives. Similarly, SCOR is currently a partner in the development of potential new projects like Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB), Surface Ocean Lower Atmosphere Study (SOLAS), and Integrated Marine Biogeochemistry and Ecosystem Research (IMBER). In conclusion, SCOR has demonstrated flexibility in its focus as ocean science has evolved, and the success of future ICSU projects and activities related to the ocean would be significantly diminished without the scientific integrity and experience of SCOR. Ocean science is inherently global, and SCOR is the instrument by

which good local ideas in this field become global. Also in this regard, the Panel finds the successes of SCOR in capacity building to be highly meritorious. SCOR should continue in its efforts to enhance the development of international science within the oceanographic community, and to bring the strongest possible representation into ongoing and future projects of the GEC programmes. The Panel encourages SCOR to explore prospects for joint capacity building initiatives with START.

Annex 15 – Post-Audit Financial Statement for 2002

	Budget			Actual		
	Disc	F-T	Totals	Disc	F-T	Totals
Income						
Membership	238,730		238,730	228,595		228,595
ICSU Grant for SOLAS		40,000	40,000		40,000	40,000
ICSU Grant for OCEANS deferred to early 2003		50,000	50,000		50,000	50,000
IOC Contract to SCOR for GLOBEC		10,000	10,000		(50,000)	(50,000)
IOC Contract to SCOR for WG 119		15,000	15,000		10,000	10,000
IGBP Contribution re OCEANS		11,163	11,163		15,000	15,000
NSF Grant/Travel Awards		75,000	75,000		-	-
NSF Grant/Science Activities	41,597	375,719	417,316	26,630	65,352	65,352
NASA and MMS Support for WG 111 Workshop		24,139	24,139		260,193	286,823
NOAA Support / GEOHAB		9,071	9,071		15,084	15,084
NOAA Support re WG 119		5,000	5,000		4,802	4,802
Sloan Foundation / WG on Technologies		59,245	59,245		-	-
OSB Contract re Ocean Exploration		7,629	7,629		24,861	24,861
Other Income + Interest + IOC prior year income				4,582	7,629	7,629
Total Income	280,326	681,966	962,293	259,807	442,921	702,729
Expenses						
WG 109- Iron in Seawater	-	-	-	(142)		(142)
WG 111 - Coastal Models	-	24,139	24,139		15,134	15,134
WG 112 - Groundwater	2,446		2,446	2,446		2,446
WG 113 - Asian Monsoons	6,000		6,000	2,224		2,224
WG 114 – Permeable Seds	203		203	203		203
WG 115 - Plankton Surveys	15,774		15,774	15,774		15,774
WG 116 - Sediment Traps	503		503	503		503
WG 117 - Decadal to Millennial Time Scales	-	-	-	90		90
WG 118 – Tech. for Census		59,245	59,245		24,861	24,861
WG 119 – Quant. Indicators		20,000	20,000	5,340	15,000	20,340
WG 120 – Phaeocystis	11,345		11,345	13,555		13,555
SCOR/IOC CO ₂ panel	8,423		8,423	8,403		8,403
JGOFS		98,330	98,330		82,871	82,871
GLOBEC		128,756	128,756		130,859	130,859
GEOHAB		25,738	25,738	(335)	25,137	24,802
Budget				Actual Income & Expense		

	Disc	F-T	Totals	Disc	F-T	Totals
SOLAS		110,477	110,477	(127)	73,829	73,701
OCEANS / IMBER		111,818	111,818	(56)	2,590	2,534
Ocean Carbon Sequestration		20,833	20,833		20	20
Travel Awards		75,000	75,000		65,352	65,352
Oceans 2020 book purchase	2,000		2,000	-		-
OSB/Ocean Exploration		7,629	7,629	160	6,322	6,482
Representation	9,169		9,169	9,048		9,048
Webpage	300		300	300		300
Publications	7,211		7,211	8,554		8,554
Annual Meeting	25,000		25,000	25,478		25,478
JHU Salaries and Benefits	133,028		133,028	131,348		131,348
Finance Officer	10,500		10,500	11,435		11,435
Communications	3,000		3,000	3,309		3,309
Office Equipment	1,500		1,500	716		716
Audit and Accounting Services	7,018		7,018	7,017		7,017
JHU overhead charges	21,572		21,572	20,824		20,824
Miscellaneous, office supplies	2,400		2,400	2,473		2,473
Bank charges				756		756
Adjustments re IOCCG				(461)		(461)
Total Expenses	267,392	681,966	916,773	268,835	441,976	711,413
Excess of Income over Expenses	12,934			(9,027)		
Beginning Accumulated Balance	112,722			112,722		
Ending Accumulated Balance	125,656			103,695		

Annex 16 – SCOR-Related Meetings (2002-2003)

2002

Feb. 9-10	Ocean Carbon Dioxide Panel	Honolulu, USA
Feb. 16-17	WG 115 – Standards for the Survey and Analysis of Plankton	Honolulu, USA
Feb. 19-22.	SC-IGBP	Stockholm, Sweden
Mar. 7-9	WG 120 – Marine Phytoplankton and Global Climate Regulation	Norwich, UK
April 5-6	GEOHAB Modeling Committee	Warnemünde, Germany
Apr. 23-26	Ocean Biogeochemistry and Ecosystems Transition Team	Potomac, USA
May 13-15	Symposium on International Global Ocean Exploration	Paris, France
May 27-31	GEOHAB SSC Meeting	Helsinki, Finland
June 3-8	IOC Executive Council	Paris, France
June 10-14	SOLAS Exec. Comm. and National Representatives	Amsterdam, Netherlands
Sept. 2-4	WG 113 – The Evolution of the Asian Monsoon in Marine Records: Comparison Between Indian and East Indian Monsoon Subsystems	Aix-en-Provence, France
Sept. 23-25	JGOFS SSC	Concepcion, Chile
Oct. 1-5	SCOR General Meeting	Sapporo, Japan
Oct. 14,16,19	GLOBEC SSC Meeting	Qingdao, China
Oct. 15-18	2nd GLOBEC Open Science Meeting	Qingdao, China
Oct. 28-30	WG 118 – New Technologies for Observing Marine Life	Lima, Peru
Nov. 13-15	OCEANS Open Science Conference Planning Committee	Potomac, USA
Nov. 16-19	WG 111 – Coupling Waves, Currents, and Winds in Coastal Models (Editorial Group)	Goa, India
Nov. 24-27	SOLAS SSC	Gif-sur-Yvette, France
Dec. 4-7	GEOHAB SSC	La Rochelle, France
Dec. 4-6	WG 119 – Quantitative Indicators	Cape Town, South Africa

2003

Jan. 6, 12-13	OCEANS Transition Team Meeting	Paris, France
Jan. 7-10	Biogeochemistry and Ocean Ecosystems Open Science Conference	Paris, France

Jan. 13-15	International Workshop on Ocean Carbon Observation Activities and Their Relation to Planned Research Projects	Paris, France
Jan. 20-24	International Geosphere-Biosphere Programme Science Committee	Punta Arenas, Chile
Feb. 19-22	GEOHAB Editorial Committee	Copenhagen, Denmark
May 2-3	OCEANS Editorial Team Meeting	Washington, D.C., USA
May 5-8	Third JGOFS Open Science Conference	Washington, D.C., USA
May 30-June 2	SCOR-IOC Project on Extending Ecosystem Models to the Basin Scale	Harlow. U.K.
June 11-21	Workshop on Real-time Coastal Observing Systems for Ecosystem Dynamics and Harmful Algal Blooms	Villefranche, France
June 15-20	Gordon Research Conference on Permeable Sediments (WGs 114/112)	Waterville, USA
June 18,19,24	GLOBEC SSC Meeting OCEANS TT Meeting	Banff, Canada
June 19,24	SOLAS SSC Meeting	Banff, Canada
June 30-July 11	SOLAS Summer School	Corsica, France
July 5-6	IAPSO/SCOR WG 121 on Ocean Mixing	Sapporo, Japan
Sept. 15-19	SCOR Executive Committee Meeting	Moscow, Russia
Sept. 26	Final JGOFS Executive Committee Meeting	Bergen, Norway
Oct. 21-25	SCOR-IOC Project on Extending Ecosystem Models to the Basin Scale	Harlow. U.K.
Oct. 22	WG 118 on New Technologies for Observing Marine Life	Washington, D.C., USA
Nov. 3-7	WG 116 on Sediment Trap and ²³⁴ Th Methods for Carbon Export Flux Determination	Catalina Island, USA
Nov. 14-16	WG 115 on Standards for the Survey and Analysis of Plankton	Concepcion, Chile
Nov. 17-20	GEOHAB Open Science Meeting on HABs in Upwelling Systems	Lisbon, Portugal
Dec. 1-3	IMBER Editorial Committee	Baltimore, USA
Dec. 4-8	WG 120 on Marine Phytoplankton and Global Climate: The <i>Phaeocystis</i> sp. Cluster as a Model	Savannah, USA
Dec. 8-10	SCOR/IGBP Meeting on Data Management for Marine Research Projects	Liverpool, UK