SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

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INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

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INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

PROCEEDINGS
OF THE
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

Volume 10, Number 1

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SCOR Proceedings Vol. 10 No. 1

Report on the eighteenth meeting of
The SCOR Executive Committee,
Canberra, Australia, 29 January to 1 February 1974

The eighteenth meeting of the SCOR Executive Committee was held at the Australian Academy of Science, Canberra, Australia from 29 January to 1 February 1974 with the President, Professor H. Postma in the chair.

Mr J. Deeble, Executive Secretary of the Australian Academy of Science, welcomed the participants on behalf of the President and Officers of the Academy. The President of the Academy, Sir Rutherford Robertson, entertained the participants to an evening reception and the members of the SCOR Executive Committee to a dinner.

A list of those attending the meeting is given in Annex I.

1.0 ORGANIZATION AND FINANCE

1.1 MEMBERSHIP

National membership -

(i) Switzerland: The Swiss National Committee (Commission for Oceanography and Limnogeology (Attn. Professor P. Tardent)
Zool. Institut der Universität,
Kunstlergrasse 16
8006 Zurich, Switzerland) had nominated three members of SCOR:
Mrs Dr Katherine Mangold-Wirz
Professor Lukas Hottinger
Professor Werner Stumm

(ii) Brazil: The National Research Council (Consejo Nacional de Pesquisas) had not yet responded to the invitation to join SCOR, conveyed following the last Executive Committee meeting.
(Brazil subsequently (February 1974) accepted the invitation and elected to adhere to SCOR in Category IV.)

(iii) Peru: In view of the increasing interest in marine science in Peru, it was agreed that following the El Niño workshop [see item 3.1] would be an appropriate time to consider inviting Peru to join SCOR or to invite a Peruvian member.

(iv) Turkey: It was agreed that the Turkish Scientific and Technical Research Council be invited to consider forming a National Committee and adhering to SCOR.

(v) Belgium: Understanding that Belgium was considering forming a National Committee on Oceanic Research, it was agreed to express SCOR's encouragement of this and to invite Belgium to adhere to SCOR. An invitation to Professor Melchior to become an 'invited member' was extant and although this would lapse if Belgium joined SCOR, Professor Melchior should be urged to respond or the invitation would be withdrawn.

(vi) Cuba: The British Royal Society had received notification from the Cuban National Correspondent for IAPSO that Cuba had formed a National Association for Ocean Physical Science. Because Cuba is known to be interested in the whole range of marine science disciplines it was agreed that Cuba be invited to consider forming a National Committee and adhering to SCOR.

Organizational Membership

IAMAP had agreed to become an 'affiliated member' of SCOR and the President of IAMAP, Dr S. Fritz, was therefore now a member of the SCOR Executive Committee, and the Secretary, Dr W. L. Godson, becomes a 'Representative Member' of SCOR (ex officio).

1.2 PUBLICATIONS

SCOR had contributed $500 to purchase nine copies of Biology of the Indian Ocean and these, together with two additional copies that had been supplied by the publishers, Springer-Verlag, had been distributed to laboratories in developing countries in accordance with a list prepared by Dr B. Zeitzschel and Dr G. F. Humphrey.

It had not proved possible to provide the financial support required by ICES to permit publication by ICES of the May 1973 Oban symposium on The Early Life History of Fish but Springer-Verlag had subsequently agreed to undertake publication as a commercial venture. The results of this symposium will be of great interest to small laboratories in developing countries and UNESCO and FAO should be invited to consider purchasing copies for free distribution to such laboratories. SCOR would be prepared to contribute up to $500 to assist.

The report of the SCOR/UNESCO/IBP-PM Working Group on Monitoring in Biological Oceanography (WG 29) was published as UNESCO Technical Papers in Marine Science No. 15 in December 1973 under the title Monitoring Life in the Ocean. A copy will be sent by UNESCO to FAO for translation into Spanish and French.

The report of the January 1973 meeting of SCOR/UNESCO/ICES/IAPSO Working Group on Oceanographic Tables and Standards (WG 10) was published in January 1974 as UNESCO Technical Papers in Marine Science No. 16. Volume 2 of the UNESCO Oceanographic Tables is now available from UNESCO for FF42. This volume contains tables on oxygen saturation values and the relation of salinity with chlorosity.

The report of the WG 21 1971 Intercomparison of current meters aboard Academik Kurchatov, would be published shortly as UNESCO Technical Papers in Marine Science No. 17.

Material for the monograph on zooplankton preservation, to be published as No. 4 in the series of UNESCO Monographs on Oceanographic Methodology was now in the hands of the editor and UNESCO should receive the final manuscript by the end of March 1974.

It was believed that the publications in the two UNESCO series were not sufficiently well known in laboratories and that it was desirable to ensure a more effective distribution. The Secretary, with the assistance of other members of the Executive Committee as necessary, was asked to examine the present UNESCO distribution list,

which included the 45 IOC Depository Libraries, with a view to ensuring that libraries of major laboratories in developed and developing countries were included in a basic list of about 150. SCOR should be prepared to advise on further distribution of individual publications when requested.

The SCOR Proposal for a GATE Oceanographic Programme had been published in 1973 by ISMG (see Item 2.2 - WG 43).

IIOE Phytoplankton Atlas. It had not been possible for UNESCO to include in the contract with Professor Krey provision for review by Professor Postma and Mr Jitts. Dr Giermann (IOC) reported that he was expecting to receive the manuscript for the Data Manual in the near future and that Professor Krey expected to complete the manuscript for the Atlas by the end of 1974. IOC will arrange for the manuscript of the Atlas to be sent to Professor Postma and Mr Jitts for review before publication.

IIOE Geological-geophysical Atlas. Dr Giermann reported that a final meeting of the editorial board would be held in April 1974 at which time it was hoped the final manuscript would be approved. The Executive Committee stated that the scientific community awaited anxiously the production of the IIOE Geological-geophysical Atlas and hoped that any financial problems likely to effect its early publication could be resolved.

Oceanography of the South Pacific 1972. The proceedings of a symposium held in Wellington from 9 to 15 February 1972, which had been sponsored by the New Zealand National Commission for UNESCO and The Royal Society of New Zealand, with financial support from UNESCO and SCOR, had been published. Copies are available at $NZ19 from The National Commission for UNESCO, Department of Education, Private Bag, Government Buildings, Wellington, New Zealand.

Proceedings of the Eighth International Conference on Radiocarbon Dating, held in Lower Hutt from 18 to 25 October 1972 which had been organized by The Royal Society of New Zealand with financial support from the New Zealand Government, IUGS and SCOR, had been published by The Royal Society of New Zealand in two volumes (Rafter, T.A. and Grant Taylor, T.L. eds.).

Some copies of the Proceedings of the SCOR Symposium on Oceanography of the South Pacific 1968 are still available from Professor W. S. Wooster.

Copies of SCOR Proceedings are sent by SCOR to all SCOR members, National Committees, interested Scientific Unions and committees and intergovernmental organizations and to all members of current SCOR Working Groups. All other distribution, including individual scientists and libraries who wish to receive copies, is by National Committees who have been requested to maintain national distribution lists and to notify the Secretary as their requirements change. Anyone wishing to receive copies should be able to do so without charge.

1.3 FINANCE

A Finance Committee consisting of Professor W. S. Wooster and Mr F. P. Anderson, in consultation with the President and Assistant Secretary, examined the interim statement of Income and Expenditure for 1973. They reported that they had approved the statement for publication - Annex II. They also reported that a preliminary examination indicated that expected income for 1974 was appropriate for the activities proposed although they did express a hope that IOC will consider the possibility of further financial support for activities connected with WG 43. They also noted the difficulty that SCOR was experiencing in fitting activities to the contract periods specified by UNESCO and IOC and hoped that steps could be taken to ensure that in future the contract periods would cover full calendar years.

It was agreed that for the time being all SCOR reserve funds should be maintained in US $, either in New York or in Europe, and that a small sterling account should be opened in London with periodic transfers from the US $ account.

The IOC representative reported that, subject to the approval of the UNESCO General Conference, the IOC contract with SCOR might be increased. He also reported that UNEP had approved an application for financial support for the activities of SCOR WG 45 and was considering sympathetically another application by IOC for financial support for the combined activities of SCOR WG's 44 and 46 and GIPME. An application which had been submitted in connection with WG 34 had been declined as being of lower priority in the UNEP programme.

The representative of UNESCO reported that subject to the approval of the UNESCO General Conference it was likely that substantial additional support for activities by SCOR would be forthcoming from UNESCO. SCOR Executive Committee expressed its appreciation to both IOC and UNESCO and agreed that consultation should take place to determine which activities of SCOR in 1974 UNESCO wished to support.

2.0 WORKING GROUPS

2.1 FORMER GROUPS

WG 15 Photosynthetic Radiant Energy (with IAPSO and UNESCO): The Chairman of the Group, Mr J.E. Tyler, had obtained agreement of his members on the physical recommendations, which completed the work of the Group. The recommendations, together with some remarks by the Chairman,appear as Annex IV. The Executive Committee expressed its appreciation that the two volume Data Report had been published by Scripps Institution of Oceanography and drew the attention of interested organizations to the availability of copies on request (See Proceedings Vol. 9, p. 3).

Members of the now disbanded Working Group were encouraged to continue to work on the problems and to publish their results in appropriate scientific journals.

It was suggested to the JOA Steering Committee that the symposium on the subject, referred to in SCOR Proceedings Vol. 8, No. 2 (p. 57) be arranged as part of the 1976 Joint Oceanographic Assembly and that Mr Tyler, with the assistance of the members of the former WG 15, be asked to organize such a session.

WG 23 Zooplankton Laboratory Methods (with UNESCO): The summary of major findings of WG 23, prepared by Dr Steedman, had been accepted for publication in the Journal du Conseil of ICES.

At its last meeting, the Executive Committee had decided to take no immediate action on the recommendation of WG 23 to establish new groups but to keep the suggestions under review. The Chairman of the former group, Dr V. Hansen has since been invited to provide advice on how SCOR might pursue the more urgent issues.

WG 33 Phytoplankton methods (with IBP/PM). Professor Banse had agreed to replace the appendix of the report, which had been submitted to the 17th meeting of the Executive Committee, with a summary of lessons that had been learned during the group's activities. Professor Banse should now be requested to submit the revised report to the UNESCO Division of Oceanography which had agreed to publish it in their Technical Series.

Dr A. Sournia had proposed a series of subject headings, and names of possible authors, or section editors, for a handbook of methods but had requested approval to convene a meeting of some of these to agree the objects and material for a handbook. It was agreed that Dr Sournia might convene such a meeting in Oslo provided financial support from SCOR was limited to four participants. Dr Sournia should be invited to submit the proposal resulting from that meeting to IABO and IABO be asked to recommend further action and to supervise the production.

A proposal by Professor Banse for a group to examine the inverted microscope method of phytoplankton counting [under the chairmanship of Mrs G. R. Hasle] was discussed. IABO was asked to consider this and to report to the General Meeting of SCOR in September 1974 and, if they supported the proposal, to recommend terms of reference and membership.

The Executive Committee agreed to encourage the University of Oslo to establish a course in phytoplankton sampling for experienced biologists. If such a course were established, SCOR should ask National Committee to send suitable participants and should ask UNESCO to consider providing financial support for selected scientists from developing countries.

SCOR/ICES Nutrient Intercalibration Experiment

Concern was expressed at the apparent slow progress with the analysis and publication of the results of the experiment, which had resulted from a recommendation of WG 25, and the President agreed to enquire of ICES whether SCOR could help to overcome any problems which might have arisen to delay the work.

2.2 EXISTING GROUPS

WG 10 Oceanographic Tables and Standards (with ICES, IAPSO and UNESCO) :

As reported under 1.2, the report of the January 1973 meeting and Volume 2 of the Unesco Oceanographic Tables were now published. The next meeting of WG 10 will be held in Grenoble in August/September 1975.

Professor Grasshoff was currently drafting the proposed statement by the Presidents of SCOR and IAPSO recommending the use of the official tables.

Professor Lacombe, as Reporter for WG 10, was asked to ascertain the status of the proposed intercalibration exercise on salinity measurements outside the normal ranges and to remind ICES of the need to nominate two replacement members of the Group.

The IAPSO Standard Sea Water Service is to be transferred to Wormley, UK, during 1974 [see section 4.1].

WG 21 Continuous Current Velocity Measurements (with IAPSO and UNESCO): As noted under item 2.1 the report of the second (1971) intercomparison was about to be published. It was reported that the draft report on the third intercomparison, aboard RV Atlantis II in 1972, had been circulated for comment to all participants and some sample sheets had been submitted to UNESCO. When approved this report will be published in the series UNESCO Technical Papers in Marine Science.

The Chairman of the Group, Dr J. C. Swallow had intimated that the group was reaching the end of its useful life and it was agreed that he be asked to submit final recommendations, to include a statement on the present status of the problem of intercomparison of current meters and what further work needed to be done.

It was agreed that WG 21 had performed a valuable function and had drawn attention to the limitations of meters and that for the immediate future further work on a bilateral basis between laboratories should be undertaken but a need for reconsideration of the problem by SCOR might arise in a few years' time.

WG 27 Tides of the Open Sea (with IAPSO and UNESCO): The Executive Committee expressed its appreciation of the support for the activities of WG 27 which had been provided, under a special contract, by UNESCO.

A report from the Chairman, Dr D. E. Cartwright was received. Extracts from this report pertaining to the sea trials on RRS Discovery in October and November 1973 and the report of the meeting of the WG on 10 November 1973 appear as Annex V. UNESCO will publish, in the Technical Series, the analysis of results when they become available following the next meeting of the Group in Brest in September 1974.

WG28 Air-Sea Interaction (with IAMAP and IAPSO): The Chairman of the Group, Professor H. Charnock, reported that the Group had met in Melbourne in January 1974 during the IAMAP/IAPSO joint scientific assembly. The report of that meeting is given in Annex VI.

Professor Charnock reminded the Executive Committee that when SCOR had joined with IAPSO and IAMAP in sponsoring this group there had been a need to stimulate work in studying the processes of energy and gas exchange between ocean and atmosphere. In the past ten years this subject had received increasing attention, as had been illustrated at the IAMAP/IAPSO assembly, and although much work remained to be done on exchange of gasses, which necessitated the involvement of chemical engineers, most of the original objectives had been achieved. The need now was for work within large scale experiments related to seasonal and climatic changes such as were now being planned [e.g. AMTEX, NORPAX, POLEX].

It was agreed it might now be appropriate for SCOR to withdraw from this group and to leave IAMAP and IAPSO to decide at their meetings in 1975 whether they wished

to continue this, or establish a new, group to develop formulae on the large scale interaction when better data sets of the surface layers become available.

SCOR should inform IAPSO and IAMAP of its impending withdrawal, to be subject to confirmation at and effective from the next SCOR General Meeting. It was agreed that a new SCOR group to consider the influence of the ocean on climate be formed - see under report of WG 34.

WG 32 Biological Data Inventories (with ACMRR): As had been reported by the Chairman, Dr J.M. Colebrook, acting as SCOR observer at the July 1973 meeting of the IOC Working Group on International Oceanographic Data Exchange [IOC - IODE] - (see SCOR Proceedings Vol. 9 Annex XV) the group had accepted the form for Results of Marine Biological Investigations [ROMBI] proposed by WG 32. At its Eighth Session, IOC had adopted a resolution [VIII - 21] urging Member States to use this second level inventory form.

The Chairman should be asked to submit a report to the General Meeting of SCOR in September 1974 expressing his views on further tasks for the group or whether it might be regarded as having completed its task and consequently disbanded.

WG 34 Oceanographic Basis of Ocean Monitoring and Prediction Systems: The Climate Panel of WG 34 met in Victoria, Canada on 20 October 1973; the report of the meeting is given as Annex VII.

The Executive Committee approved the Panel's recommendation that Dr H. Iida, Tokyo Meteorological Agency be added to the membership.

Cdr Ataide suggested that the Panel might be interested in using the facilities of the laboratory being established by Portugal in The Azores and reported that in that region there was an area 600 miles in latitude and 300 miles in longitude for which long time-series of records existed, taken by vessels on regular routes between Portugal and The Azores. The Executive Committee commended to the Panel the potential usefulness of The Azores station as a centre for its work and invited Dr Dickson to correspond with Cdr Ataide.

The Theoretical Panel had met in Melbourne on several occasions during the IAMAP/IAPSO Assembly in January 1974 and had held a meeting with WG 38 in Canberra on 28 January 1974. A report of these meetings is given as Annex VIII. Professor Robinson, Chairman of the Panel, informed the Executive Committee of the recommendations that had been formulated during these meetings which concerned not only the subject of eddy dynamics, which had until now been the main preoccupation of the Panel and had resulted in the Mid Ocean Dynamics Experiment (MODE), but also with the two subjects on which the SCOR Executive had sought advice; oceanographic programmes during FGGE and, with WG 38, problems of Antarctic dynamics.

The studies of eddy dynamics undertaken during MODE and the USSR POLYGON experiments had reinforced the earlier belief in the importance of mesoscale eddies in dynamical models and that the scope of the phenomena demanded a major international investigation. The next step would be the joint USSR, UK, USA POLYMODE investigation in 1976 and further international participation should be encouraged. International collaboration was also necessary for a number of smaller studies to provide an indication of the geographical range of the phenomena. All laboratories interested in contributing to these programmes should communicate with Professor Robinson.

Oceanographic programme to be undertaken during FGGE should be designed with two considerations in mend. Firstly, the second GARP objective, to improve the understanding of the physical basis of climate, requires an improved understanding of ocean processes and secondly it is desirable to exploit to the maximum the unusually complete global coverage of atmospheric measurements of FGGE. The recommendations of the panel indicate the types of experiment that should be considered and these include

Special studies in the southern oceans to take advantage of the greatly improved meteorological coverage.

Investigations in tropical regions on the ocean's response to atmospheric forcing [e.g. INDEX] including the general response of the equatorial undercurrent.

Dynamics of the upper layers of the ocean and ocean/atmosphere exchange processes [e.g. NORPAX, JASIN].

Ocean wide studies of current variability indices to determine major current systems warranting further detailed monitoring.

The Panel, meeting with WG 38, recognized the complex and interesting problems of the dynamics of the Antarctic oceans, the importance of studying the Antarctic circumpolar current, convection processes and the exchange processes of sea-ice-air for determining the energy balance of the polar heat sink. All these processes may have important effects on the remainder of the world oceans.

Although investigations of the Antarctic had increased during the last decade or so the total extent of knowledge was still relatively small and the panel, believing that it was now becoming feasible to mount more complex programmes, recommended strongly the initiation of the first stages of a large scale study. The initial field programmes should be undertaken against a strong theoretical background with the main objective of defining the scales of processes in space and time and providing the basis for the design of future experiments.

The joint meeting had been informed of the US proposals for an International Southern Ocean Study [ISOS], a programme funded under the US IDOE programme, and had agreed that participation by other interested nations should be encouraged because ISOS provided a sound basis for longer term investigations. Dr D. J. Baker (USA) reported that the ISOS plan constituted a two year programme concerned with heat transport and exchange processes and current variability which represented the initiation of activities proposed in a document about to be published by the US Academy of Sciences entitled Southern Ocean Dynamics - A strategy for scientific exploration 1973 to 1983 and was restricted to problems which could be studied with presently available techniques.

Sir George Deacon, Chairman of WG 38, expressed his appreciation of the carefully considered advice of WG 34 (TP) and agreed that it was best for large complex studies such as MODE and POLYMODE, JASIN and NORPAX to be undertaken in more accessible regions, and the lessons learned applied to the Antarctic as soon as possible while immediate high latitude field work concentrated on the kinds of studies envisaged in the ISOS and POLEX programmes.

It was considered desirable for SCOR to help to promote investigations in Antarctic waters and for any group established for this purpose to maintain strong links with a number of other SCOR groups to provide the necessary international forum for considering the scientific questions raised and to recommend future programmes.

In view of all the above considerations, WG 43 (TP) recommended some changes in the SCOR Working Group structure and at the same time recommended establishing a group to be concerned with mathematical modelling, which would relate to other relevant groups.

After careful consideration, the SCOR Executive Committee decided on the following action.

WG 34 to be renamed Internal Dynamics of the Ocean (with IAPSO) with terms of reference as follows:

"To identify the critical scientific problems of the internal dynamics of the ocean and to suggest the most appropriate ways to study them; to advise on the design of mid ocean dynamics experiments."

Membership to consist of the present theoretical panel as follows:

A. Robinson (USA) (Chairman); A. Gill (UK); K. Hasselmann (FRG); P. Welander (Sweden); L.M. Fomin (USSR), N.A. Phillips (USA).

Executive Committee reporter - Dr K. Voigt.

One or two additional members to be proposed by the Chairman if required.

The Ocean Climate Panel of WG 34 to be transferred to WG 48.

WG 38 to be renamed Ocean processes in the Antarctic (with SCAR and IAPSO) with terms of reference as follows:

"to recommend observational and theoretical studies to facilitate the design of a major study of the circulation of Antarctic ocean. The group will take into account the findings of WG's 34 and 48 and integrate their recommendation with the plans of WG 47."

IAMAP to be invited to co-sponsor the new group.

Membership to be reconstituted as necessary in view of new terms of reference.

Executive Committee reporter - Professor A. S. Monin.

WG 47 Oceanographic programmes during FGGE (with IAPSO)

Terms of reference to be as follows:

"To develop plans for comprehensive oceanographic programmes associated with FGGE and to assist other appropriate international and national bodies in the implementing of such programmes."

IAMAP to be invited to co-sponsor the group.

Professor H. Stommel (USA) to be designated Chairman, other members to be selected, in consultation with him.

Executive Committee reporter - Professor W. S. Wooster.

WG 48 Establish new working group on The Influence of the Ocean on Climate (with IAPSO) with terms of reference as follows:

"to identify the major influences of the ocean on global climate and to advise on the design of programmes for their investigation".

IAMAP to be invited to co-sponsor the new group.

Chairman and members to be selected.

Executive Committee reporter - to be appointed.

Transfer to this group the Ocean Climate Panel from WG 34 with the following terms of reference:

"to examine available methods and programmes for monitoring variations in ocean climate and to recommend means for their improvement."

Membership of the panel to remain as:

R. R. Dickson (UK) (Chairman); J. Namias (USA); J. Smed (Denmark); P. Hupfer (GDR); S. Tabata (Canada); H. Iida (Japan).

WG 49 Establish new working group on Mathematical Modelling of Oceanic Processes (with IAPSO) with terms of reference as follows:

"To review the findings of other SCOR working groups as they relate to the mathematical modelling of oceanic processes, and to advise on the objectives and design of relevant numerical models."

Chairman and members to be selected.

Executive Committee reporter - to be appointed.

WG 35 Methods in Quantitative Ecology of Coral Reefs (with IAPSO):

A report from the Chairman, Dr D. R. Stoddart, was received. - Annex IX. The Chairman should be asked to provide a summary of the Heron Island field meeting.

Noting that it was the intention of the group to produce a handbook of coral reef research methods, which would include recommendations regarding intercomparable methods, and that the group had suggested Springer-Verlag as possible publishers, the Executive Committee felt that such a volume would be of great value to laboratories in the tropical developing world but that the cost of a commercially produced publication might effect adversely the availability. It was agreed to bring to the attention of Dr Stoddart the existence of the series 'UNESCO monographs in oceanographic methodology and to request him to discuss with the UNESCO Division of Oceanography the possibility of publishing in this series.

The proposal to produce a multilingual dictionary of reef terminology was supported and it was suggested that this might be published in the series UNESCO Technical Papers in Marine Science. When Dr Stoddart had produced a draft of terms in English, SCOR would invite the Soviet National Committee to assist in the identification of a Russian contributor to the editorial group.

WG 36 Coastal Upwelling Processes (with ACMRR and ACOMR): The second meeting of the group (both panels) will take place in Kiel in June 1974; it had not proved possible to advance the date of the meeting, as had been suggested at the last Executive Committee meeting. It was agreed to ask IOC to forward to the Chairman, Dr K. N. Fedorov, a copy of the report of the February 1974 meeting of the ICG - CINECA for consideration by WG 36.

WG 37 Marine Plankton and Sediments: About 250 scientists had sent preliminary registrations for the Symposium being planned by WG 37 for September 1974. A second circular giving the preliminary programme had been distributed in October 1973. Arrangements for the meeting were now completed and, as had been agreed at the 17th Executive Committee meeting, the President had written to relevant National Committees inviting them to support invited participants from their countries. UNESCO had agreed to provide up to $5000 towards the expenses of this meeting, CMG had requested IUGS to provide up to $5000 and the Executive Committee agreed that a similar amount might be provided by SCOR.

WG 38: As reported under WG 34, this group is to be re-designated Ocean Processes in the Antarctic with revised terms of reference and membership. A final, brief, statement is required from the original WG 38 responding to the questions identified by the first meeting of the ICG - SOC.

WG 40 Paleo-oceanography: The final report of the first meeting of the group, 19 to 22 May 1973, had been distributed to the members of the Executive Committee. It was agreed that, the Chairman be asked to clarify some details of the report and that a summary version be published (see Annex X).

The Executive Committee was pleased to learn that plans were proceeding for a small technical workshop on mathematical data and statistical models for quantification of paleo-oceanographic data in Madison, USA, 4 to 8 April 1974, for which funds had been secured and that a technical report would result.

A proposal for a meeting of the group during the WG 37 Symposium in Kiel should be referred to Professor Seibold to ascertain whether he could accommodate a one day meeting of those members of WG 40 attending. It was not considered justifiable for SCOR to provide other than nominal financial support, of perhaps 'per diem' for members if the WG 37 meeting was held outside the Symposium dates, and no funds should be allocated for travel other than for invited participants in the Symposium. The Chairman should be asked to clarify the relationship of WG 40 with CLIMAP, an IDOE project under which funds for attending meetings should be available.

The USSR National Committee will be invited to nominate a member for WG 40.

The Executive Committee encouraged WG 40's proposal eventually to produce a report describing the field of paleo-oceanography which might prove suitable for one of the UNESCO series.

WG 41 Morphological Mapping of the Ocean Floor: A status report from the Chairman, Dr A. S. Laughton, (Annex XI) was received. The formation of the new GEBCO Guiding Committee with Dr Laughton as SCOR nominee was noted and the SCOR Executive Committee expressed its strong support for the establishment of a permanent geoscience unit and hoped the GEBCO Guiding Committee would find ways of overcoming the financial barriers which had so far prevented action on this essential prerequisite for an effective new 1:10M series.

WG 42 Pollution of the Baltic (with ICES): The report, and its eight annexes, of a meeting of the group held from 28 to 29 June 1973 had been sent by ICES to members of the SCOR Executive Committee. Professor G. Kullenberg had been appointed Chairman of the Group.

ICES should be advised of SCOR's concurrence with their proposal to publish Annex 5 of the report, Research Programme for Investigation of the Baltic as a Natural Resource, in the ICES Cooperative Research Report series, provided the cover acknowledged SCOR's involvement in the group.

The report of the meeting, the recommendations and the report of the Action Planning Group are given as Annex XII.

SCOR will accept an invitation from ICES to co-sponsor a special meeting on models of water circulation in the Baltic, Charlottenlund Slot 26/27 September 1974 because it was likely to be of wide international significance. SCOR had, at short notice, provided financial support to enable an expert appointed by WG 42 to visit laboratories in Baltic countries to discuss the different methods of analysis for pollutants.

It was noted that various specialist meetings had been proposed by WG 42 and the establishment of four expert task groups for different aspects of the study had been proposed by the Action Planning Group. These, and other, activities related to Baltic Pollution were considered to be purely regional matters which should be financed by the nations concerned and the only SCOR support should be for any scientists nominated by SCOR from non-Baltic countries.

SCOR had agreed to join ICES in launching this regional study but now that all countries surrounding the Baltic were able to join ICES, it was not clear why the group felt that SCOR should not now withdraw from this activity. The President was asked to discuss this with the Chairman and the General Secretary of ICES.

WG 43 Oceanography related to GATE: A brief status report by the Chairman, Professor G. Siedler was received. Professor J. Woods, a member of the group, in amplifying this report explained that the GATE meteorological experiment only required data on the surface temperature of the ocean whereas the programme that had been prepared by WG 43 was concerned with processes in the upper layers of the ocean which effect the surface temperature.

Appreciation was expressed to ISMG for publishing the programme prepared by WG 43. It was understood that copies had not yet been sent to National Committees and ISMG should be asked to provide sufficient copies for this. SCOR also noted with appreciation the agreement of the French National Bureau for Oceanographic Data to establish the GATE Oceanography Data Centre at Brest under the direction of M Peluchon.

Recommendations prepared at a 'C-scale' meeting 1 to 5 October 1973 and subsequently accepted by WG 43 are given as Annex XIII. The Executive Committee approved the WG 43 interpretation of its terms of reference, as given in Recommendation No. 7.

Proposals for two meetings of principal investigators in 1974, London 26 to 28 February and Leningrad in April, to discuss operational details, data management and post-GATE activities, were approved. Other travel requirements in 1974 which might become necessary will be subject to the approval of the President. This might include travel support for the two WG 43 nominees on the international data validation group and small 'ad hoc' meetings. In 1975 it was expected that WG 43 would need at least two meetings, one about March/April and another in September during the IUGG General Assembly at which a GATE (Oceanography) symposium might be arranged.

At its meeting in February 1974 WG 43 would be considering how best to seek an oceanographer to work at Dakar with the ISMG during phase III of the experiment and would be discussing the need for special arrangements to facilitate scientists from other countries working for periods, of perhaps up to six months at a time, at the specialized scientific analysis centres.

The SCOR Executive Committee expressed its warmest congratulations to Professor Siedler for the way in which he and the members of WG 43 had collaborated to produce such an effective programme in a short time. The group was encouraged to continue to coordinate the programme of the experiment, the data management and analysis of results although it was recognized that these activities were not normally considered to be functions for SCOR. It was noted with appreciation that IOC had contributed about $2500 towards supporting participants in WG 43 meetings in 1973 but nevertheless the cost to SCOR had been almost $14 500. IOC should be asked to reexamine the possibility of providing fuller financial support in 1974 and 1975, particularly in view of resolution EC-II.15 which acknowledged that the EC-II proposed oceanographic programme of GATE will contribute to the goals of IDOE and requested SCOR to carry out detailed scientific and logistic planning of the programme.

WG 44 Tropospheric Transport of Pollutants (with ACOMR and IAMAP): The President reported that despite considerable correspondence with prospective Chairmen and discussions on the subject, he had been unable to initiate the formation of the Group. There appeared to be a reluctance amongst people closely involved with the subject to form another group which might overlap with other activities and it seemed necessary to reconsider, in more precise terms, the functions for the group. Also there seemed to be a feeling that there should first be a symposium on the subject at the IUGG General Assembly in 1975.

It was now generally agreed that the quantity of pollutants entering the ocean via the atmosphere was considerably greater than had been thought a year or two ago and that it was important to stimulate work before 1975 on the processes of transfer. It was realised that it was not at all clear how these processes might be studied but it was felt that techniques for measurements near the sea surface were within reach. Some suggestions by Professor R.W. Stewart on what SCOR might attempt were noted.

A number of scientists were known to be working on aspects of the problem and it was necessary to bring together a group, that would complement the relevant commissions of IAMAP, to identify the important substances entering the ocean, means of analysing them both in the air and the sea and to determine their fate in the ocean. It was agreed that if such a group were to be activated this year, a symposium in 1975 would be of value.

Professor W. S. Wooster undertook to discuss the problem with scientists in his own laboratory and others in North America and to prepare a proposal on how best to proceed. He would also correspond with the IAMAP Commissions and various other scientists whose names had been suggested. It seemed likely that a proposal would emerge for an early 'ad hoc' meeting to discuss just what was feasible for a SCOR WG in this field. Dr Tandberg offered facilities in Sweden for such a meeting.

WG 45 Marine Pollution Research (with ACMRR, ACOMR, ECOR and ICES)

A draft report of the second meeting of the group, held on 22 November 1973, had been distributed to participants and others by the Chairman, Dr G. F. Humphrey.

The meeting had been called primarily to consider the draft plan for GIPME prepared by the consultant appointed by IOC. The group had been most disappointed that the plan had not been developed to a more detailed stage, did not take account of the role of SCOPE or UNEP in the overall problems of global pollution and indeed was the wrong kind of document on which to base a global investigation of pollution in the marine environment. It was suggested that, probably, it would be better for the ICG-GIPME to work from the Fisheries Report 112 (Castellebate report).

It was suggested that the IOC should endeavour to collect, before the next meeting of ICG-GIPME, regional statements on present levels of those pollutants considered locally to be important (e.g. Baltic, NW Atlantic, NE Atlantic, Mediterranean, SW Atlantic). Such statements would also help in the assessment of the 'Health of the Ocean' being prepared by another IOC consultant. Although it did not seem likely to be available in the near future, such a document was considered essential before the ICG-GIPME would be likely to make much progress.

Dr Humphrey considered that, as he was now chairman of IOC, it would be anomolous for him to remain the SCOR member on the Working Group and, consequently, he tendered his resignation.

In the discussion that ensued a number of points were agreed.

As it was the function of this group to correlate the activities of the subsidiary groups of the sponsoring organizations and not itself to initiate research or serve as a group of experts, it was inappropriate for it to have the status of a Working Group. Henceforth it should be known as the SCOR/ACMRR/ACOMR/ECOR/ICES/GESAMP Liaison Panel on Marine Research related to Pollution, although for SCOR domestic purposes it might continue to be known as WG 45.

In order to ensure awareness of related activities, the new chairman of the liaison panel should, ideally, also be SCOR's nominated member on SCOPE and its Commission on Environmental Monitoring and Assessment and be SCOR's observer at meetings of ICG-GIPME. This would necessitate attending three or four meetings a year and maintaining active correspondence.

It was recognized that SCOPE and UNEP had responsibilities for studying complete cycles of, and establishing monitoring programmes for, pollutants on a global scale including air, land and sea. The recent report "SCOPE - 3" Global Environmental Monitoring System - Phase 1 included a number of references to the oceans and, in some instances, possible areas for SCOR assistance were identified.

It seemed likely that most of the proposals for monitoring of pollution in the ocean, within the global environmental framework, were first thoughts which had not been fully considered within a marine science forum. The marine proposals of SCOPE-3 left much to be desired but it was recognized that nothing more satisfactory could have been produced within the limited time available.

There was considerable feeling that an adequate scientific basis did not yet exist for the establishment of other than purely regional programmes of monitoring marine pollution and that considerably more knowledge of basic physical and biological oceanography was needed. Much of the activity of SCOR Working Groups contributed to this and was thus directly relevant to the study of pollution and SCOR should continue to concen-

trate on basic science. It was its duty to initiate work on factors which it could judge to be essential and to concentrate, in a careful and well considered fashion, on tasks where basic science problems needed solution. By so doing SCOR would be doing the work for which its scientists are uniquely equipped.

SCOR must continue its concentration on furthering understanding of basic subjects, such as water movements and marine ecology, and undertake only limited activities concerned with particular aspects of the pollution problems, such as tropospheric transport and river inputs. SCOR should continue to be prepared to respond to specific requests from SCOPE, IOC and other organizations, might consider the timeliness of including in the 1976 Joint Oceanographic Assembly one or more symposia on pollution related subjects, and should invite IABO to advise on how best to encourage research on processes of microbiological degradation and synthesis of pollutants.

It was recognized that some of the views expressed insisted that marine science was not yet advanced to a stage where major efforts in pollution monitoring could be employed in a meaningful way and that some monitoring programmes which might be instituted prematurely might provide a mass of data which could be of little long term value because of the impossibility at the present time of separating natural variations from those caused by man's activity and that therefore SCOR should direct its attention to the solution of basic problems.

IOC, nevertheless, had undertaken a responsibility to develop a programme for global investigation of pollution in the marine environment and SCOR had an advisory commitment to IOC. Perhaps IOC should concentrate on mechanism of distribution, effect and fate of pollutants in the sea and determining the basis for monitoring rather than attempting to develop monitoring programmes at this stage.

It was apparent from the discussion that many participants had serious doubts about the correct role for SCOR in the field of pollution research and a conviction that the numerous subsequent discussions had done little to advance on the Castellebate report. Perhaps the time had come for SCOR and the other advisory bodies to convene a special meeting to consider carefully what should be done in the light of the views expressed, the commitments to advise IOC and, more particularly, IOC Resolution VIII-2. SCOPE-3 and relevant resolutions of SCOPE.

The President and Secretary should seek to appoint a new Chairman for the liaison panel on marine research related to pollution, who might also represent SCOR on SCOPE and ICG-GIPME or arrange for an interim chairman to serve until the next SCOR General Meeting. The liaison panel should be asked to prepare recommendations for consideration at the General Meeting on what activities related to marine pollution research are appropriate for SCOR and the manner in which SCOR should continue to advise on these matters.

To achieve this the President might authorise a meeting of a number of specialists and the members of the Panel.

The Secretary should invite the members of the Executive Committee, the liaison panel and others to offer comments on the marine sections of SCOPE-3 for consideration.

WG 46 River Inputs to Ocean Systems (with ECOR, IASH, ACMRR and UNESCO): Membership of the Group had been established as follows:

D. Lal (India) (Chairman); R. Chesselet (France); E. Eriksson (Sweden); D. Eisma (Netherlands); K. K. Turekian (USA); J. A. da Costa (UNESCO); F. Fournier (IASH).

The Chairman had consulted the members of the Group by correspondence and was planning to convene a meeting in Paris in February or March. (This meeting was subsequently postponed until 24/27 June.)

A suggestion from the United Kingdom that Dr J. D. Burton be considered for membership was conveyed to the Chairman.

WG 47 Oceanographic Programme during FGGE (with IAPSO):
As reported under WG 34, Professor H. Stommel is to be appointed Chairman.

2.3 NEW WORKING GROUPS

As reported under WG 34, new groups will be formed as follows:

WG 34 becomes:
Internal Dynamics of the Ocean (with IAPSO)

WG 38 becomes:
Ocean Processes in the Antarctic

WG 48 The Influence of the Ocean on Climate

WG 49 Mathematical Modelling of Oceanic Processes

WG 50 Biological Effects of Ocean Variability (with ACMRR, IAPSO and IABO):
The Executive Committee agreed to a proposal from ACMRR to co-sponsor a new working group with the following terms of reference:

> To review data from biological monitoring programmes and those relating to ocean climatological data from the same regions and periods, to consider the synthesis of such data and the hypotheses that could be erected to account for the observed interactions, and to assist in the organization of a Special Symposium for the JOA in which selected case studies of the interactions between environmental changes and those in the distribution and abundance of fish stocks or other marine organisms could be presented.

For many years there has been awareness of the relationship between ocean variability and fluctuation of fisheries and other marine organisms. SCOR held a symposium on the subject in May 1966, which as noted in SCOR Proceedings Vol. 5 No. 2 had been published as Vol. 5 of Progress in Oceanography. Now that the report of WG 29 had been published it was considered appropriate for a Working Group to be established on this topic. The Executive Committee recalled the paper published by WG 29 in 1972 entitled 'The instability of Ocean Populations' which pointed out that changes in biota were as likely to be caused by natural ocean variability as by effects of man and it was necessary to try to understand the effects of factors other than pollutants. Discussion among the members of WG 29 and others, especially during 1972, had led to the proposal to ACMRR for the new working group, to be jointly sponsored by SCOR, IAPSO and IABO, which would take into account relevant regional activities

(North Sea, North Atlantic, North Pacific, "El Niño" etc) and would assist in organizing a symposium on the subject at the Joint Oceanographic Assembly 1976. Membership should be established by consultation with Dr Longhurst and the other sponsoring organizations.

Dr Steyaert (UNESCO) proposed that SCOR might consider establishing a new interdisciplinary group on mangroves. He explained that UNESCO was embarking on a programme of study of the ecology of coastal systems as part of its support for developing countries and had noted a recent ECOSOC resolution which had stressed the importance of the tropical coastal areas. A very high percentage of these areas were mangrove and UNESCO had decided that the first phase of its new programme would be to support mangrove studies at the Phuket Marine Biological Centre, Phuket, Thailand. UNESCO had invited Dr W. E. Odum (USA) to prepare a review of the scientific problems and would welcome the advice and assistance of SCOR.

IABO had discussed mangrove ecology at its last meeting and had agreed that the time was now appropriate to establish a project of intrinsic scientific merit that would be of interest to developing countries and had in mind to organize a symposium on the subject. Having agreed that SCOR might direct more attention to the coastal zone, Dr Steyaert was asked to prepare a statement of UNESCO interest and to forward this, with a copy of Dr Odum's report, when available, to SCOR. SCOR will refer both documents to IABO and invite their advice on appropriate action for SCOR for consideration at the General Meeting in September 1974.

Chairmen of all new Working Groups should be informed of the procedures for SCOR Working Groups [SCOR Proceedings Vol. 9 Annex XIII] and chairmen of all current groups should be reminded of the importance of keeping the respective Executive Committee Reporters informed of all the groups activities. [SCOR Proceedings - Vol. 9 p. 3]

Executive Committee Reporters for SCOR Working Groups:

WG 10	H. Lacombe	WG 36	H. Lacombe	WG 44	A. S. Monin
21	K. Voigt	37	T. F. Gaskell	(45)	G. Hempel
27	H. Lacombe	38	A. S. Monin	46	T. F. Gaskell
28	A. S. Monin	40	T. F. Gaskell	47	W. S. Wooster
32	R. I. Currie	41	T. F. Gaskell	48	to be appointed
34	K. Voigt	42	K. Voigt	49	" " "
35	G. Hempel	43	K. Voigt	50	" " "

3.0 RELATIONS WITH INTERGOVERNMENTAL ORGANIZATIONS

3.1 INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

The Executive Committee warmly congratulated Dr G. F. Humphrey on his election as Chairman of IOC.

IOC Eighth Assembly:

There were no requests to the advisory bodies for advice, but three resolutions and one item in the Report of the Eighth Assembly of IOC called for specific action by SCOR.

Res. VIII-15 Requested SCOR to include standard oceanographic sections in oceanographic programmes proposed for FGGE. This request was conveyed to the Chairman of WG 47.

Res. VIII-25 section H Requested SCOR, with the assistance of UNESCO and IOC as necessary, to arrange for countries to revise their national entries for a new international directory of marine scientists, the first draft of which was to be produced by FAO in accordance with criteria agreed upon by SCOR. The Secretary of SCOR reported that he had asked for copies of any existing national lists of marine scientists which he would send to FAO for inclusion in the first draft, which FAO hoped to produce by April 1974. This draft would be sent to National Committees and others for correction after which a second draft print-out would be produced by FAO which would again be referred back to National Committees. It was hoped to produce the final Directory by January 1975 and thereafter at five-yearly intervals.

Regarding criteria, it was agreed that in reviewing the first draft, national committees should be asked to regard as guidelines the criteria that had been proposed by SCOR in connection with the 1970 directory. The biggest problem appeared to be in connexion with the subject index and the Executive Committee confirmed the view that had been expressed at its previous meeting that the subject index should be restricted to a maximum of 10 categories to cover the whole field of marine science. It was not considered appropriate for Fisheries Science to be sub-divided nor was it considered appropriate to have a category entitled Pollution.

Res. VIII-28 Invited advisory bodies to nominate representatives on the Consultative Board for ASFIS. It was agreed that the President should nominate an observer to attend the first meeting of the Consultative Board and the question of a permanent representative of SCOR should be re-considered at a later meeting.

SC. II report p. 14 Asked SCOR to comment on the preliminary report Metallogenesis, Hydrocarbons and Tectonic Patterns in Eastern Asia prepared by an IOC-CCOP IDOE Workshop, Bangkok, September 1973. The President of CMG agreed to send copies of the report to all members of his Commission and to invite their comments by 30 March 1974, which he would collate and then advise SCOR how to respond to the IOC request.

Other IOC Resolutions which were discussed were:

Res. VIII-2 This was referred to the Chairman of the Joint Liaison Panel on Marine Research Related to Pollution for consideration.

Res. VIII-17 Professor W. S. Wooster reported that he had been appointed Chairman of the Steering Committee for the El Niño Workshop and it was now proposed to hold the Workshop in Quito, Equador in September 1974. A number of papers would be invited which would present the background knowledge and there would be ample time for discussion and for the development of possible lines of research.

SC. II report p. 2 & 3 contained a proposal to establish an 'ad hoc' group of experts on Pollution of Oceans Originating on Land (POOL) which was expected to meet in March 1974 and to coordinate its work with WG 46.

The report of the SCOR observer (Professor McGillavry) at the IOC-CICAR assessment meeting was received.

Noting that IOC proposed to hold the next meeting of the ICG-Southern Oceans in Buenos Aires in mid 1974, it was agreed that it would be appropriate to invite the Chairman of the reconstituted SCOR WG 38 to attend as SCOR observer.

Dr Humphrey drew to the attention of the Executive Committee the fact that many delegations had called for more science at IOC meetings, but little in the way of positive proposals had resulted other than a general recommendation that nations include scientists in their delegations.

There was considerable discussion on this and it was recognized that the field of international marine science had to embrace two main problems:

a) That of bringing to the attention of scientists the oceanographic problems facing governments and obtaining their advice on how best to tackle these and implement worthwhile cooperative studies.

b) That of helping scientists to study problems which they had identified and which needed international help to implement.

These problems can best be solved by close collaboration between IOC and SCOR and the other advisory bodies.

3.2 UNESCO

SCOR had been represented at a UNESCO meeting of South Eastern Asia Marine Science experts, Hong Kong for the 6 December 1973 by Dr G. F. Humphrey.

Dr Steyaert reported that the UNESCO Advisory Panel for Marine Biological Centres would be holding its next meeting in Singapore in March/April 1974 and he hoped that SCOR would nominate a representative to that meeting. As SCOR had decided to appoint Professor J. E. G. Raymont to effect liaison with UNESCO, (see Annex III) it was considered appropriate to ask him to act as SCOR observer at this meeting although it was appreciated that he was the Chairman of the Panel. IABO should be consulted and may wish to suggest that Dr Wolff also attend.

UNESCO was planning a Seminar on the Biology of the Benthos of the Continental Shelf of the East Coast of Latin America in Buenos Aires and Dr J. A. Allen (UK) was convener of the Organizing Committee.

A report of a special session of the SCOR Executive Committee to discuss SCOR's role in training education and assistance to developing countries is given as Annex III.

3.3 FAO/ACMRR

No questions regarding liaison with FAO were raised other than those reported under 2.2 - WG 50 - and 3.1 - ASFIS.

3.4 WMO/ACOMR

Noting that the WMO Executive Committee had formed an inter-governmental panel for FGGE, with provision for representatives of ten interested nations, ICSU, JOC, ESRO, IOC and the Presidents of two WMO Commissions, and in view of the proposals regarding oceanographic programmes during FGGE expected to be developed by WG 47, SCOR should seek representation on the Panel and, if accepted, would nominate the Chairman of WG 47. SCOR would see no objection to the same individual representing both SCOR and IOC but both organizations should have the right of independent representation.

The WMO Executive had formed a Panel of Experts in Atmospheric Aspects of Environmental Pollution. The Chairman of ACOMR had expressed a hope that this Panel would work with SCOR WG 44. This could be effected by the ACOMR nominee on WG 44; such a nomination will be made when the Chairman has been appointed for WG 44.

As a consequence of the proposal by JOC for GARP to convene a meeting to discuss a programme of expendable drifting buoys during FGGE, SCOR had joined with JOC, WMO, IOC and SCAR in arranging a preparatory meeting on the subject, in Paris in June 1973. The report of this meeting had been distributed widely by the organizations concerned, in September 1973.

The formal meeting on expendable drifting buoys had been arranged from 5 to 8 March 1974 in Geneva. Invitation to participate had been issued by WMO to Permanent Representatives of WMO member governments, to IOC, SCOR and SCAR. A copy of the agenda for this meeting was being sent by the Secretary to National Committees suggesting they discuss participation with National organizations adhering to WMO, IOC, GARP and SCAR. A similar suggestion was being distributed by SCAR and IOC to their national adherents.

It was agreed that the Chairman of WG 47, Professor H. Stommel, should be asked to represent SCOR at this meeting and to present his preliminary views on oceanographic programmes during FGGE which might utilize this technique.

4.0 RELATIONS WITH NON-GOVERNMENTAL ORGANIZATIONS

4.1 AFFILIATED ORGANIZATIONS

IAPSO

The President of IAPSO, Professor H. Lacombe reported that the IAPSO/IAMAP joint scientific assembly in Melbourne the preceding two weeks had been most successful with some 500 scientists attending. Many aspects of the problems of air/sea interaction had been discussed in the joint meetings and the IAPSO scientific sessions had concentrated on the upper layers of the ocean. The meetings had been made possible through considerable help from other interested organizations and the financial assistance of SCOR and UNESCO was acknowledged. A Report of the meetings and a Report of the IAPSO Executive Committee meetings will be produced.

Professor Lacombe reported that arrangements had been concluded to transfer the IAPSO Standard Sea Water Service from Charlottenlund to Wormley, UK. There were still some outstanding financial questions but it was expected that these would be resolved shortly by IUGG/IAPSO and that the last batch of "Copenhagen" water would be produced in April 1974 and the first batch of "Wormley" water might be available about September 1974.

IAPSO was now actively working on its plans for symposia during the next IUGG General Assembly from 26 August to 6 September 1975 in Grenoble, France. IAPSO was participating in many inter-association meetings which included 'tropospheric transport of pollutants' and 'nearshore oceanography'. The Executive Council had also discussed the IAPSO participation in JOA-1976.

IABO

The second volume of IABO Proceedings had been published. IABO should be asked to ensure that all members of the SCOR Executive Committee receive copies.

IABO was co-sponsoring, with IBP/PM, FAO and UNESCO, a symposium on Grey Mullet at Haifa from 2 to 8 June 1974 and was in the process of forming two working groups with ACMRR as follows:

man made effects on marine communities and ecosystems

determination of the biological effects of pollution (bioassays and toxicity tests).

IABO expected shortly to resolve the remaining difficulties regarding a continuing committee for coral reef studies within the structure of IABO.

CMG

The sixth meeting of CMG had been held from 13 to 14 November 1973 in Dusseldorf. A summary report of that meeting had been distributed to members of the SCOR Executive Committee.

The Chairman of CMG, Dr T. F. Gaskell, reported that many of the projects which had been identified at the Honolulu Geoscience Workshop in 1972 were now under active investigation under IDOE. This included the proposal by CCOP/SOPAC for an IDOE Workshop on the South-West Pacific. CMG was cooperating with CIESM in organizing a symposium on Mediterranean Geology and Geophysics which would be held in March 1975 in Majorca.

CMG was organizing, in association with other appropriate associations, four symposia for the XV IUGG General Assembly in 1975, four symposia for the XXV International Geological Congress 16 to 25 August 1976 in Sydney and four symposia for the JOA.

IAMAP

IAMAP had accepted an invitation from SCOR to become an affiliated member and consequently the President, Dr S. Fritz (USA) now becomes a member of the SCOR Executive Committee. He was represented at this meeting of the SCOR Executive Committee by Professor Charnock.

4.2 ICSU

1. General Committee

A report by Professor G. Hempel SCOR Observer at the meeting of the ICSU General Committee in September 1973 had been distributed. The first recommendation of the ICSU General Committee, entitled 'Cooperation in Marine Research', invited SCOR to submit a report to the Fifteenth General Assembly of ICSU in September 1974 on progress in improving the understanding of the marine biota, their productivity and their reaction to changes in the environment both natural and man-made. SCOR and the other international marine science organizations, had, for many years, been concerned with the general problem of the relationship between oceanic variability and biological productivity and had held a symposium on the subject in 1966. Many of the SCOR Working Groups had contributed to the knowledge of these interactions and in particular the report of WG 29 provided a basis for further study which had resulted in a proposal to form a new joint SCOR/ACMRR/IABO Working Group (WG 50). It was agreed that the Secretary be invited to produce a draft general statement on the contributions to this subject which had been made by SCOR and its associated organizations and that this draft be sent to selected individual scientists for comment. WG 36 and the El Niño Workshop should be asked to consider the ICSU request and the Secretary's draft statement. It might prove desirable to organize a small Workshop under the leadership of IABO in collaboration with FAO and to include Dr Barber and Dr Dugdale to produce a final report for ICSU.

ICSU General Committee recommendations 5 to 11 inclusive were also brought to the attention of the SCOR Executive Committee. The following actions were proposed:

Recommendation 5 regarding the Global Atmospheric Research Programme should be referred to the Chairman of WG 47.

Recommendation 7 stating that conference registration fees should not normally exceed US $30 and under no circumstances exceed US $50 was noted and will be brought to the attention of the UK National Organizing Committee for the JOA.

Recommendations 6, 8, 9, 10 and 11 - the Secretary was asked to note these and to take the necessary action.

Recommendation 12 regarding relations with other organizations, SCOR believed that it had always endeavoured to effect adequate relations with other international organizations concerned with marine science.

2. A circular dated 31 October 1973 from the Secretary General of ICSU which was addressed to all Unions, Committees, Commissions and Permanent Services of ICSU, drawing attention to a recent UNESCO Executive Board Resolution regarding membership by Taiwan of non-governmental organizations was noted. The report of a recent ICSU mission to the People's Republic of China was noted and SCOR should await the decision of the next ICSU General Assembly on this question before reconsidering its own position. Meanwhile the circulars from ICSU should be copied to members of the Executive Committee.

3. As a non-governmental organization with consultative status with ECOSOC, ICSU will be invited to send an observer to the UN Law of the Sea Conference 1974 and had sought the advice of SCOR on how best the non-governmental scientific community as represented by ICSU might be represented adequately at the Conference. After considerable discussion the SCOR Executive Committee concluded that it would be impractical to try to

maintain a representative of the scientific community throughout what was likely to be an extended Conference. It was realised that both ICSU and SCOR were most concerned that an acceptable degree of freedom for scientific research at sea should be maintained and it was necessary therefore to ensure that the scientific viewpoint was represented at the Conference. ICSU had already submitted a statement on the subject, together with the resolution from the 1971 ICSU General Assembly, to the United Nations and this document had been accepted as a conference document by the Sea-Bed Committee Sub-Committee 3 which was concerned with scientific research. SCOR noted with pleasure that IUBS had expressed its strong support for the ICSU resolution and hoped that other Unions would likewise.

It was agreed to recommend to ICSU that the President of ICSU, or if he were unable to participate personally, some other officer of ICSU acting as his representative, might make a presentation on behalf of the scientific community. If the President of ICSU agreed to this proposal SCOR would provide ample material for his consideration.

National Committees should again impress upon their governments the importance of freedom for scientific research and should urge their governments to seek advice on this question from their own national scientific community. National Committees should also be asked to request their governments to keep them informed of the progress of the Conference and in particular when matters concerning scientific research were to be raised. Members of the Executive Committee and National Committees should be requested to convey any information they received regarding the progress of the Conference directly to the President of SCOR who would, through all possible routes, attempt to keep in touch with developments in Caracas and be prepared at short notice to go to the Conference, or to request some other representative who was acquainted with the interests and activities of the marine science community, when such representation appeared desirable. It was hoped that such persons appointed by the President of SCOR would be able to occupy the ICSU seat.

Meanwhile the SCOR Executive Committee requested IOC to distribute copies of the ICSU statement and resolution (UN document A/Ac. 138/SC. 111/L. 38) to IOC member states for information.

Professor Wooster reported that the US National Committee had recently produced a report on marine scientific research in relation to the Law of the Sea Conference and that copies of this report would be sent to all SCOR members and National Committees. Copies would also be sent to IOC and ICSU.

4.3 ICSU UNIONS

IUPAB

The International Union of Pure and Applied Biophysics had nominated its Secretary General, Dr R. D. Keynes, as a representative member of SCOR.

IAG

The International Association of Geodesy had referred to SCOR a resolution which had been passed at a recent symposium of the Association on the Earth's Gravitational Field and Secular Variations in Position. This resolution noted the discrepancies in the definition of a height datum and recommended detailed studies of the relation between geodetic and oceanographic height datums. Professor Lacombe reported that IAPSO had already referred this resolution to a joint IAG/IAPSO Study Group on mean sea level which was considering changing its terms of reference to include this particular problem. There was also a possibility that the Group might propose a special symposium

in 1977 on this topic. IAPSO was invited to keep SCOR informed of progress and to advise if SCOR could assist in any way.

4.4 ICSU COMMITTEES

SCIBP

Following an inquiry from the President, Professor M. J. Dunbar had reported that the editing of the synthesis volumes of IBP/PM was proceeding. Professor Dunbar was asked to provide for the general meeting in September 1974 a statement on which IBP marine programmes should be considered for continuation by IABO or other marine science organizations.

SCOPE

Reports by Dr G. F. Humphrey, SCOR nominated member of SCOPE, who had been invited to a meeting of the SCOPE Working Group on Environmental Monitoring and Assessment in London from 17 to 21 September 1973 and who had represented SCOR at the Second General Assembly of SCOPE in Kiel in October 1973, had been sent to members of the Executive Committee. Dr Humphrey reported that the discussions at the Working Group had been the most scientific and relevant he had heard at any meeting connected with pollution although the group had been charged with an unreasonable task of preparing, in a short time, recommendations on studies needed to provide the scientific information necessary for monitoring and assessment of the whole environment. Much of the time had been devoted to considering a report prepared by Dr R. E. Munn acting as SCOPE consultant under contract to UNEP. A numer of suggestions had been offered for inclusion in the revised version, (which has been published as SCOPE-3). Many of the recommendations concerning the marine environment may be critized by the marine science organizations, but it was emphasised that Dr Munn alone had had to produce this wide ranging report in a limited time and the Executive Committee accepted Dr Humphrey's view that the report was a tremendous job and probably no one person could have covered the fields better.

It was regretted that advice had not been sought from the marine science organizations, which might have produced more practical recommendations on marine monitoring but this would have taken much longer to achieve. It was regarded as unfortunate, also, that marine scientists were being asked to cooperate on pollution subjects both through IOC-ICSPRO-GESAMP and through SCOPE and unless carefully planned this could result in an unnecessary burden. Numerous other international organizations were arranging meetings related to some aspect of marine pollution and the relatively few scientists who could be regarded as experts in this field were becoming increasingly disillusioned about the value of these meetings, which occupied so much of their time, and little or no real progress was being made. Even after three years and various meetings, many felt that the Castellebate report remained the most effective document on which to plan activities for the near future.

As indicated in the report under WG 45, in relation to GIPME, a strong feeling was developing that SCOR should concentrate on the research needed before realistic global plans could be developed. SCOR should encourage regional studies (such as the North Sea, the Baltic and the Mediterranean) and process studies (such as atmosphere to ocean transfer and river inputs) and look more deeply into the basic problems with less emphasis on global monitoring until the scientific basic had been more soundly established.

It would be a task for the SCOR Liaison Panel on Marine Research related to Pollution (WG 45) to consider more deeply the role of SCOR in these matters, bearing in mind that the competence of SCOR lies primarily in fundamental research on the sea. Nevertheless, SCOR should continue to be prepared and willing to assist SCOPE on marine problems. In ICSU, SCOPE must serve as the central coordinating body on environmental problems and should seek advice on marine matters through SCOR.

It is desirable that the SCOR nominee on SCOPE (see section 2. 2 - WG 45) attends all SCOPE Committee and Assembly meetings and for SCOR to participate in relevant SCOPE Commissions and Working Groups. In particular SCOR should, when so invited. nominate a representative on the SCOPE Commission on Environmental Monitoring and Assessment.

SCOPE was producing a manual on analytical methods for selected pollutants in the environment, but this seemed to be concerned only with analysis of solutions prepared from samples. If it is desirable for marine laboratories to use comparable methods for analysis of pollutants, SCOR might feel it necessary to produce guidance on methods of sampling, storing and preparation of solutions; this had already proved a major problem in the Baltic study (see WG 42 report Annex XII).

SCOPE had approved a proposal by the Canadian National Committee for SCOPE to sponsor a conference in September 1975 on Arctic Ecosystems which would be intended to summarize and assess existing knowledge of Arctic Ecosystems, to exchange information on national programmes, to define future research requirements and to examine the advantages and feasibility of a coordinated international research programme. Professor M. J. Dunbar had been appointed Conference Chairman by the Canadian Committee for SCOPE and had reported that it was intended to arrange the conference under four main headings: terrestrial, freshwater, marine and bioclimate. The SCOR Executive Committee confirmed its interest in being kept informed of the marine part of the programme for this conference and offered to assist in any way possible. Further information about the conference should be conveyed to SCOR national committees when available.

SCAR

Plans for the SCOR/SCAR Polar Oceans Conference to be held in Montreal from 6 to 11 May 1974 were proceeding. SCAR had nominated Mr G. E. Hemmen as a representative member of SCOR. He reported that plans for the Ross Ice Shelf drilling project were proceeding, a pilot project would be undertaken in 1974/5 and this would include some sub ice sampling by physical and biological oceanographers. There would be some piston coring of the sediments but plans for deep sediment drilling had been deferred for a main project at a later date. During the present meeting of the SCOR Executive Committee liaison had been effected between the President of CMG and the Secretary of the SCAR Working Group on geology and it was hoped that the two groups would work closely together on matters concerning Antarctic marine geology and geophysics.

COSTED

Dr O. Tandberg reported that he had consulted COSTED regarding the plans for the special session on training education and mutual assistance and the Secretary of SCOR had informed COSTED that SCOR would be willing to assist in COSTED objectives but it was difficult at the present time to see how this could best be effected and had proposed that as an interim measure the SCOR Secretariat be regarded as the point of contact with COSTED. The question of appointing a SCOR representative to COSTED should be considered again at the general meeting.

4.5 ECOR

Dr T. F. Gaskell had presented to the members of the SCOR Executive Committee a report on a Council meeting of ECOR held at Dusseldorf on 12 November 1973. It was noted that ECOR was participating in the activities of relevant Working Groups of SCOR and was assisting in the organization of some of the sessions for the Joint Oceanographic Assembly 1976. The present level of relationship with ECOR was considered to be satisfactory.

5.0 FUTURE MEETINGS

5.1 SCOR/SCAR POLAR OCEANS CONFERENCE 6 TO 11 MAY 1974

It was confirmed that SCOR was prepared to make a financial contribution to this Conference, if required.

5.2 WG 37 SYMPOSIUM ON MARINE PLANKTON AND SEDIMENTS
Kiel 9 to 13 September 1974

Progress with the organization of this symposium is reported under Item 2.2 - WG 37.

5.3 TWELFTH GENERAL MEETING

Invitations to host the Twelfth General Meeting of SCOR in September 1974 had been received from Israel, South Africa and Sweden and Ecuador was considering offering an invitation. The Executive Committee agreed that wherever possible SCOR meetings should be held in countries where the marine science activity was developing and, noting that in September 1974 IOC hoped to hold an El Niño Workshop in Quito, Ecuador, it was agreed that it would be most appropriate for SCOR to participate in the discussions of this interesting scientific topic and a meeting in Ecuador would provide an opportunity for SCOR members to discuss problems with scientists in South America. It was agreed therefore that if an invitation was forthcoming from Ecuador it be accepted. Participants in the SCOR meeting should join the scientific discussions on El Niño and SCOR business meetings might be held concurrently with some of the organization sessions of the Workshop. SCOR might investigate the possibility of arranging a charter or group travel from Europe to Quito. Dates were not determined but in arranging the dates the officers of SCOR should bear in mind the meetings of other ICSU bodies in September.

SCOR expressed its appreciation to Israel, South Africa and Sweden for their invitations and noting that the Executive Committee had already held meetings in Israel and Sweden it was suggested that, if possible, the Executive Committee meeting in May 1975 might be held in South Africa.

5.4 JOINT OCEANOGRAPHIC ASSEMBLY

The steering committee for JOA met on 31 January, and the report of this meeting appears at Annex XIII.

In closing the meeting the President expressed sincere appreciation to the Australian Academy of Science for the excellent facilities and technical assistance that had been provided for the meeting and expressed particular gratitude to Mr J. Deeble and to Mrs E. Lincoln for their assistance.

ANNEX I

EIGHTEENTH SCOR EXECUTIVE MEETING

Canberra, Australia

29 January to 1 February 1974

List of participants

MEMBERS OF EXECUTIVE COMMITTEE

* Prof. H. Postma	Netherlands	President
* Prof. W. S. Wooster	USA ACMRR	Past President
* Mr R. I. Currie	UK	Secretary
* Dr T. F. Gaskell	IUGS/CMG ECOR	Ex Officio
* Prof. H. Lacombe	IUGG/IAPSO	Ex Officio

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* Mr G. E. Hemmen	UK SCAR	Assistant Secretary

ANDERSON, Mr F. P.	South Africa	
* ATAIDE, Cdr. J.	Portugal	
* BATTAGLIA, Prof. B.	Italy	
BOWDEN, Prof. K. F.	UK	
CHARNOCK, Prof. H.	UK CH-WG 28	IAMAP
* DEACON, Sir George	UK Ch-WG 38	
GIERMANN, Dr G.	IOC	
GOUVEIA, Miss M. J.	Portugal	
* HUMPHREY, Dr G. F.	Australia	
* ROCHFORD, Mr D. J.	Australia	
STEYAERT, Mr M.	UNESCO	
* TANDBERG, Dr. O. G.	Sweden	
WOODS, Prof. J. D.	UK	

The following attended on 29 January only, for discussion of WG 34

* ROBINSON, Prof.	USA Ch-WG 34
NEAL, Dr V. T.	USA
BAKER, Dr D. J.	USA

* = SCOR Members

STATEMENT OF SCOR INCOME AND EXPENDITURE

(1 January - 31 December 1973)

			$
BALANCES 1 JANUARY 1973			
In Paris		1 219.23	
In La Jolla		29 422.93	30 642.16
INCOME			
National Contributions		34 500.00	
UNESCO Contracts:			
UNESCO and IOC 1972 (final)	14 000.00		
Third contract 1972 (final)	2 000.00		
" " 1973 (total)	4 500.00	20 500.00	
FAO Contract WG 36		1 200.00	
Bank interest		665.56	
Miscellaneous:			
Sale of office equipment	17.18		
Net gains on exchange less Bank charges	481.05	498.23	57 363.79
			88 005.95
EXPENDITURE			
Working Groups:			
10		2 366.70	
15		30.01	
21		948.42	
23		340.73	
27		5 335.64	
34 (Climate Panel)		889.96	
35		3 947.17	
36		7 403.84	
38		177.80	
40		3 071.35	
41		2 693.72	
42		1 660.15	
43 and GATE planning meetings		13 262.09	
45 and representative at ICG-GIPME		1 876.11	44 003.69
Representation at other meetings:			
ICSU General Committee		94.35	
COSPAR		250.50	
SCOPE Assembly		375.00	
SCOPE and IOC WG future structure		271.20	
IOC-EC II		382.73	
IOC-VIII		778.32	
IOC-IODE		840.65	

	$	$
IOC CICAR	161.31	
TEB (WMO/ICSU) two meetings	671.60	
GEBCO Committee	424.76	4 250.42
Meetings:		
Executive Committee Meeting	1 469.55	
Polar Oceans Conference	1 000.00	
Early life history of fish	2 371.36	
Biology of Indian Ocean	501.39	
IAPSO	2 000.00	7 342.30
Administration		5 110.68
Publications (Proceedings Vol 8.2 and Vol 9)		2 206.88
		62 913.97
BALANCES AT 31 DECEMER 1973		
New York	15 586.64	
London	257.89	
Paris	9 247.45*	25 091.98
		$88 005.95

* includes $219.23 in Indian Rupees

ANNEX III

TRAINING EDUCATION AND MUTUAL ASSISTANCE

Resulting from a request of the seventeenth meeting of the SCOR Executive Committee (SCOR Proceedings Vol. 9 p. 13) to Dr O. G. Tandberg to prepare and organize a special session at the eighteenth Executive Committee meeting to consider a role for SCOR in relation to the promotion of marine science in developing countries, Dr Tandberg had sought views from a wide range of scientists. Dr Tandberg presented a 30 page report in which he had brought together extracts from the responses from 22 scientists together with other relevant information, including the recommendations from a marine science workshop sponsored by the School of Advanced International Studies of the Johns Hopkins University (USA) and held at the University's international affairs centre in Bologna, Italy, in October 1973. The president thanked Dr Tandberg for his report which, together with a short paper from the British National Committee, formed the basis for the discussion.

Although the special session on TEMA did identify some suggestions for ways in which SCOR could help, it was agreed that National Committees be invited to consider carefully the following report of the discussions and that the subject be raised again at the Twelfth General Meeting of SCOR in September 1974.

Perhaps the main conclusion that had emerged from both the Bologna Workshop and from the responses to Dr Tandberg's enquiries and which was supported by the SCOR

Executive Committee was that before effective assistance could be provided for developing countries to increase their marine science capabilities, it was essential for governments of such countries to recognise the need for and problems of marine scientific research and to be prepared to undertake a commitment to afford marine science a degree of priority within their national policies. Support from developed countries or UN agencies could assist in the development, or expansion, of national or regional programmes but would be effective only if the countries themselves were anxious to participate actively and to continue to promote the research and teaching after the initial period of assistance. Otherwise training would be wasted and career prospects for marine scientists would be non-existent; this would lead to their seeking posts elsewhere. In the IOC - TEMA WG, the Bologna workshop and elsewhere, a number of developing countries had expressed a real desire to increase their own marine science competence. Support of such desires and the provision of assistance should be a priority for the international organizations, including SCOR, not only in order to provide desirable aid to the developing world but also to help the much needed production of more marine scientists throughout the world and also to increase the total world knowledge of oceanography, particularly in near shore regions.

An important requirement was thought to be new training centres and research laboratories in developing countries. As oceanography is the application of a variety of different scientific disciplines to the study of the sea, it is necessary first to have strong bases in all aspects of the natural sciences. Where universities already exist which teach basic science, it should be possible to build on this and any new marine institutes which might be established should have strong links with local universities.

Developing countries should be encouraged, and assisted, to institute post-graduate teaching courses in those branches of marine science most relevant to their needs. Senior scientists from developed countries should be encouraged to devote significant periods of time, perhaps two or three years, to helping to establish such courses. There would nevertheless remain a requirement for facilities for more advanced students to attend established courses abroad and to take advantage of shipboard fellowships. Such experts-in-training should be encouraged on their return, to visit institutes and universities in their own country to aid the dissemination of knowledge and experience.

Once a government of a developing country showed a clear desire to build its own competence in marine science and was prepared, within the limits of its ability, to provide the necessary support and facilities, UNESCO and IOC could then provide assistance and guidance and should be able to look to SCOR for advice and help, both in refining the ideas and developing programmes. It was stressed that in most instances it would be wise, initially, for training and research programmes to concentrate on those branches and problems of marine science which were of peculiar local interest or were applicable to the country's economic development. It would be necessary, therefore, to identify in each case concise programmes related to these interests rather than attempting to stimulate growth in all branches of marine science in each country. Regional activities might be designed in such a way that a number of centres collaborate with each other, each concentrating on one aspect of marine science, with interchange of scientists between the countries concerned.

On occasions in the past, bilateral links between institutes in developed and developing countries have proved beneficial as have other bi-lateral arrangements which facilitate exchange of personnel. It was recommended that IOC be invited to compile details of all bi-lateral arrangements relevant to marine science to encourage the development of inter-institute links and to encourage marine scientists to take advantage of available exchange schemes.

It did not seem possible for SCOR alone effectively to promote research interests in developing countries nor did it seem appropriate for SCOR to take initiative in the establishment of teaching programmes. However, it was becoming apparent that there were a number of ways in which SCOR might assist UNESCO and IOC in the development of regional research activities and in the establishment of training programmes. The main contributions SCOR might take were thought to be as follows:

1. UNESCO has responsibility for advising member states on matters concerning national development and regional and international cooperation. It is necessary to establish a mechanism whereby the competencies of UNESCO and SCOR are combined in order to establish the best and most appropriate research programmes, taking into account the needs and wishes of the countries. UNESCO must be responsible for the first appraisal of any proposal for a regional programme or, on the other hand, for stimulating the desire of developing countries to establish a marine research capability related to their own economic advancement. Even at this early stage it would be advantageous if UNESCO were to ask marine scientists to accompany their missions so that discussions with government officials could be supplemented by symposia at which local scientists would talk about regional problems. This would help the local scientists to further the appreciation of marine science in their government and academic circles.

   Once UNESCO had made a first appraisal, this might be submitted to SCOR for more detailed comment and criticism on which UNESCO could base further negotiations. Once programmes had been selected and agreed SCOR should collaborate with UNESCO in implementing them. Firm procedures for SCOR/UNESCO collaboration did not seem feasible because of the differing needs of each country, but SCOR might indicate clearly to UNESCO its readiness to assist in any way possible.

2. Marine scientists from developing countries should be afforded facilities for joining research cruises of major laboratories. SCOR might emphasize the desirability of this and encourage scientists organizing cruises to make available at an early stage the information requested by IOC regarding cruise plans and the likely availability of space for visitors. The dissemination of such information through the IOC "declared national programmes" system should be encouraged. However, it was suggested that SCOR might encourage cruise leaders to facilitate the participation of marine scientists not only in cruises but also in their planning and in the subsequent working up of results.

3. SCOR might, through its National Committees, suggest that cruise plans be arranged in such a way that when ships visit ports in developing countries they spend a few days there so that contacts can be established with local laboratories. Seminars could be arranged and achievements of cruises explained. This would be particularly helpful if the port was near a developing regional centre or if a collaborative project in the area was being considered.

4. Whenever feasible SCOR should be prepared to accept the attachment to its Working Groups of one or two scientists from developing countries. New sources of funds may have to be found to cover the expenses of travel and subsistance for such attached members.

5. In instances where it would not detract from the efficiency of a WG meeting or scientific workshop, they should be held in a developing country and discussion would prove beneficial to the local scientific community. Chairmen of all SCOR WG's should be asked, when considering proposals for their next meetings, to give special consideration to the idea. It might, however, be necessary to establish a mechanism for finding

suitable host countries for WG's that do not require the facilities of an advanced laboratory for the conduct of their work.

6. SCOR itself should continue, and perhaps expand, its policy of holding general meetings or meetings of its Executive Committee in countries where marine research activity was expanding. This had proved successful on two or three occasions in the past and had stimulated such countries to form national committees and to join SCOR. (As will be noted from Item 5. 3 SCOR was hoping to hold its twelfth general meeting in Latin America, with a view to stimulating discussions with local scientists.)

7. When collaborative programmes are proposed, participation from developing countries should be encouraged from the outset. SCOR might consider this when commenting on IOC proposals.

8. SCOR might encourage senior scientists from developed countries to make some sacrifice of their own research time to make extended visits to laboratories in developing countries. In cases where a University in a developing country wished to start new training programmes in marine science it might be desirable for senior teaching staff from developed nations to spend as much as two or three years in establishing such courses on a sound footing.

9. SCOR's competence lay mainly in studying the major scientific problems of the world oceans and this should continue to be SCOR's main preoccupation: in the longterm the advancement of scientific knowledge and the free availability of results must be to the benefit of all nations. Nevertheless SCOR should give UNESCO all possible help in promoting marine science in developing countries, although it must be appreciated that SCOR's expertise in fisheries and technology was less than that of some other advisory bodies. Nevertheless in advising on research projects to be undertaken by new research institutes in developing countries SCOR might assess and advise on suitable instrumentation, and so avoid the prevalent current situation where sophisticated instruments are provided from development funds for laboratories which are unable to utilise them effectively, or to maintain them. SCOR itself cannot help directly in obtaining places on research cruises other than giving general encouragement to the IOC efforts in this direction.

It was unanimously agreed that SCOR, at its General Meeting in September 1974, should again consider the whole question of assistance to UNESCO and IOC on training education and mutual assistance for developing countries, and might consider establishing a special group, to develop these ideas.

As an interim measure, the Executive Committee agreed to invite Professor J. E. G. Raymont to serve as its correspondent on TEMA matters to effect liaison with UNESCO and IOC.

Professor Raymont should be invited to take into consideration all the suggestions of ways in which SCOR might help and, in consultation with UNESCO and IOC and taking into account reports of meetings of relevant subsidiary groups of these organizations, prepare specific recommendations for actions for SCOR consideration at the General Meeting. He might also be asked in the meantime, when suitable occasions arose, to advise the President when UNESCO wished to invite the attachment of scientists to their missions and to offer recommendations.

Executive Committee reporters for Working Groups should encourage chairmen of appropriate working groups to hold their meetings in developing countries and, through

Professor Raymont, to seek any assistance they might require of UNESCO or IOC in arranging facilities with host countries.

COSTED should be informed of these proposals of SCOR and be advised that SCOR will assist COSTED wherever possible but, for the time being at least, SCOR believes that it can most effectively contribute through the UNESCO Division of Oceanography and IOC.

ANNEX IV

SCOR WORKING GROUP 15 (with UNESCO and IAPSO)

PHOTOSYNTHETIC RADIANT ENERGY

RECOMMENDATIONS

The terms of reference given to Working Group 15 by SCOR were:

(i) To identify exactly what measurement of irradiance is required by biological oceanographers;

(ii) To recommend apparatus and procedure for measuring the variable defined above.

The Working Group has confined its activity to the measurements of radiant energy as it relates to the determination of oceanic primary productivity by the C^{14} incubation technique.

With respect to term of reference (i):

The basic recommendation of Working Group 15 is that biologists should measure the total-quanta available for photosynthesis within the wavelength limits 350 to 700 nm. The units of this measurement would be quanta per unit area per sec.

Because of the technical problems associated with the measurement of spherical irradiance (i.e., a measurement giving equal weight to quanta arriving at a point from all possible directions) Working Group 15 recommends a measurement of total downwelling irradiance (in quanta per unit area per sec) on a horizontal flat surface, and within the wavelength limits 350 to 700 nm.

In the event that no quanta meter is available, the subordinate recommendation of Working Group 15 is that biologists should measure total downwelling irradiance (in watts per unit area) on a horizontal flat surface and within the wavelength limits 350 to 700 nm.

With respect to term of reference (ii), Working Group 15 recommends that:

Apparatus recommendation:

I. The radiant-flux sensor for measuring downwelling quantum irradiance should incorporate:

a) A photosensitive device having suitable spectral-sensitivity characteristics and adequate response for the planned application.

b) An optical filter having spectral transmittance such that the product of its spectral transmittance multiplied by the spectral sensitivity of the photosensitive device (multiplied (when necessary) by the spectral transmittance of the collector in C below) imparts equal quantum sensitivity to the combination, within the wavelength limits 350 nm and 700 nm and substantially zero sensitivity at other wavelengths.

c) A white irradiance collector, that is, a radiant flux collector that performs the integration specified in the equation below and that exhibits minimum selective absorption, especially in the spectral region 350 nm to 700 nm.

$$E = 2\pi \int_{0^\circ}^{90^\circ} B \sin \theta \cos \theta \, d\theta \qquad (1)$$

In the equation, E represents the total collected quanta per unit area per sec and B represents the quanta per unit solid angle per unit area per sec arriving from various directions.

II. In the event that no quanta-meter can be made available, the subordinate recommendation of Working Group 15 is that the photosensitive device be fitted with an optical filter (in place of the filter discussed in (b) above) having spectral transmittance such that the product of its spectral transmittance multiplied by the spectral sensitivity of the photosensitive device (multiplied (when necessary) by the spectral transmittance of the white collector), imparts equal energy sensitivity to the combination, within the wavelength limits 350 nm and 700 nm and substantially zero sensitivity at other wavelengths. Recommendations (a) and (c) in this section remain the same.

Procedural recommendations:

I. For measuring downwelling quantum-irradiance in the ocean, Working Group 15 recommends the following procedural details:

a) "Downwelling irradiance" as used herein implies that the underwater irradiance collector is horizontally oriented. When necessary, precautions should be taken to insure horizontal orientation.

b) Measurements of irradiance should be obtained in the vicinity of the phytoplankton samples that are being studied. Both the quanta meter and the phytoplankton samples must be far away from any perturbation of the normal light distribution, due to the presence of the ship or other interfering obstacle.

c) At each location and depth, the measurement of quanta should be sufficiently prolonged to obtain a useful average value.

d) Measurements with a quanta meter should be corrected for the optical immersion effect.

e) The underwater quanta meter should be equipped with a suitable depth transducer.

II. For measuring downwelling quantum-irradiance at deck level, and/or in an incubator, Working Group 15 recommends:

a) A horizontally oriented quantum-irradiance meter mounted in gymbals and located in an open area as free as possible from interference from shadows cast by the ship's rigging or equipment.

b) The quantum-meter should be constructed so that it can be immersed in each section of the deck incubator so that measurements of total quanta available for simulated-in-situ carbon fixation can be made.

c) Measurements of quantum irradiance in each section of a deck incubator, and the incubation of all photosynthesis samples, should be conducted under lighting conditions that closely simulate the natural lighting conditions encountered by the phytoplankton in the ocean at the depth from which they were collected.

Comments on Recommendations

In circulating these formal recommendations to members of the Working Group for signature, the following comments have been offered by individual members.

H. Jitts has commented that Procedural Recommendation I(c) is "weak and unclear". Professor Ivanoff has suggested the inclusion of a numerical specification of accuracy in the measurement of quanta above the surface. N. G. Jerlov and E. Steemann Nielsen have jointly advocated greater technical detail.

These criticisms are in large part corrected by the information given in the section headed, Discussion of State of the Art, which follows.

Y. Ochakovsky has pointed out that under term of reference (ii) (section on Apparatus Recommendation), if no quanta meter can be made available, the energy units in Equation 1, section I(c), will be E, in watts/area and B, in watts/unit solid angle area. Also, in Section I and II of the Procedural Recommendations, if measurements in watts are made, all references to quanta meters and quantum units must be changed to energy units (i. e., watts). Dr Ochakovsky is correct.

Discussion of State of the Art

by

John E. Tyler - Chairman W. G. 15

The concepts and procedures set forth in the above Working Group 15 recommendations were employed successfully during the SCOR DISCOVERER Expedition and an adequate technology exists.

The purpose of this addendum to the Working Group 15 recommendation is to relate and reference this technology.

The conceptual objective of recommendation (i) is to measure the quanta (or energy) available to the phytoplankton. Radiant flux will be "available" to oceanic phytoplankton only if the wavelength distribution of the flux lies within the spectral sensitivity range of the phytoplankton and then only if that flux can be successfully collected, in a geometrical sense, by the phytoplankton.

In order to fulfill this latter conceptual requirement, it is necessary to have detailed information regarding the directional collecting properties of phytoplankton populations. This information is not available and it was therefore necessary for the Working Group to consider measurements that would closely approximate the directional collecting properties of the phytoplankton. The Working Group would have preferred to recommend a measurement of spherical quantum irradiance (as implied in recommendation (i)) but felt that spherical irradiance collectors were not sufficiently well developed.

The radiometric concepts of irradiance, spherical irradiance (and others) are defined and discussed in detail in references (1), (2), (3), and (7). Simple instruments for measuring irradiance and quantum irradiance in the ocean have been described in references (4), (5), and (6).

Detailed data on the spectral quanta (and energy) that penetrates into various types of ocean water are available in the Data Report of the SCOR DISCOVERER Expedition (reference 9, Sections F and G) and in reference (8)). These data are useful in determining the sensitivity requirements of submersible irradiance meters. It has been estimated that irradiance meters for this purpose should be calibrated with an accuracy better than $\pm 5\%$, should exhibit a precision of 1% and that experimental measurements of quanta/$m^2 \cdot$ sec (or watts/m^2) in the ocean should have an accuracy better than $\pm 10\%$.

The measurement of irradiance (in any inuts) from shipboard is made difficult by the presence of the ship which casts a large shadow, by the motion of the air-ocean interface which superimposes noise on the measurement and by variations in surface flux due to clouds. No quantitative evaluation of the effects of these problems has been made. Section I(c) of the Prcoedural Recommendations alludes to these problems.

It has been suggested that a continuous record of surface quanta should be made and that underwater measurements of quanta should be averaged over a period at least as long as one ocean-swell period.

Methods for correcting for the optical immersion effect referred to in Procedural Recommendations I(d) are detailed and illustrated in reference (4). The depth transducer referred to in Procedural Recommedation I(e) should have an accuracy consistent with the objectives of the research.

For the experiment on the SCOR DISCOVERER Expedition, a continuous recording of total quanta/m^2 (350-700 nm) was obtained in the simulated-in-situ incubator (under a blue-green filter--see comments below on Section II(c) of Procedural Recommendations), a continuous recording of total quanta/m^2 (350-700 nm) was also obtained at a depth of one of the in-situ incubation bottles, and total quanta/m^2 (350-700 nm) was measured as a function of depth in the ocean in order to locate the in-situ incubation bottles at depths where the available quanta/m^2 was the same as measured under blue-green filters in the various sections of the deck incubator. Additional details of this

procedure are given in the Data Report of the SCOR DISCOVERER Expedition, reference (9), Sections A and Introduction.

Section II(c) of the Procedural Recommendations requires that the spectral and spatial distribution of radiant flux in each incubator section should simulate the natural spectral and spatial distribution of the radiant flux available to the phytoplankton in the natural environment. The spatial distribution of underwater radiant flux has been measured and the data published in references (10), (11), and (12). The spectral distribution of underwater radiant flux is recorded in references (8) and (9) - Sections F and G.

The incubator used in the SCOR DISCOVERER Experiment was divided into sections, each one of which was painted to simulate the measured spatial distribution of underwater radiant flux. (Data for this purpose is available in references (10), (11), and (12).) Each section of the incubator was covered with one or more blue-green glass filters chosen to simulate the spectral distribution of the underwater radiant flux at different depths. Additional details of this procedure are recorded in reference (9), Section B.

Additional references relevant to the DISCOVERER Experiment will be found at the end of the text that precedes each section of the Data Report of the SCOR DISCOVERER Expedition (reference (9)).

Brief reports of the SCOR Working Group 15 planning meetings in 1964 and 1966 and of the sea trials in 1968 are published in references (13), (14), and (15).

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ANNEX V

SCOR WORKING GROUP 27 (WITH ICES AND UNESCO) TIDES OF THE OPEN SEA

Report on 4th Meeting, Wormley, UK, 10 November 1973

Members present: Cartwright, Dohler, Hyacinthe, Radok, Schott, Voit and Zetler. Munk and Teramoto sent their apologies for their inability to attend. M. Demerliac of SHOM, Brest, attended as an observer. Zetler acted as Secretary for the meeting.

Dr David Cartwright, Chairman, reviewed the following changes in membership: Schott for Germany; Eyries replaced by Hyacinthe, with Eyries listed as his alternate; and Zetler as alternate for Munk.

The Chairman read the SCOR terms of reference for the Working Group. There were no comments. The agenda for the meeting was then distributed.

1. Intercalibration Exercise

   (a) The Chairman reported on the mooring cruise (30 October to 7 November 1973) in which eight gauges were deployed on a line west from Brest as follows:

Depth 2200 M

No. 1-FSMW	No. 4-IOS-B	No. 7-SHOM
No. 2-COB	No. 5-IOS-W	No. 8-Canada 2
No. 3-NOAA	No. 6-Canada 1	

FSMW (= F. Snodgrass, M. Wimbush) records absolute pressure using Hewlett-Packard crystals.

COB (CNEXO) records differential pressure using a vibrating wire.

NOAA (Filloux gauge) records differential pressure using a Bourdon tube and optical lever.

IOS (Bidston) includes 2 Hewlett-Packard crystals, 1 vibroton and 1 strain gauge.

IOS (Wormley) uses a capacitance plate and a strain gauge sensor.

Canada measures differential pressure using a bellows transducer.

SHOM (French) records absolute pressure using a vibrating wire.

A deep-sea gauge developed by IOS-Wormley had not yet been retrieved from its previous mooring in the OVERFLOW experiment. It was recovered in mid-November and will be placed in the test area next February. M. Hyacinthe with withdrawn his shallow water gauge from the experiment because it is soon to be put on a six month test alongside the tide gauge in Brest Harbour.

All eight gauges were launched successfully but the FSMW had to be recovered, a leaking o-ring corrected, and relaunched. There were also some difficulties in launching the very bulky NOAA capsule. Ten days in December are allocated for recovery.

(b) Proposed analysis of data. All participants are to edit and remove drift from their own data and then furnish hourly series (exact GMT hours) on punched cards to all participants. Time and units (cm or mbar) to nearest unit are to be specified. The format of data on cards is to be as follows·

Column 1	-	blank
2	-	station number as per previous list
3	-	blank unless more than one sensor on gauge, then 1, 2, etc. as appropriate
4-6	-	day number of year
7-8	-	73 (for 1973)
9-80	-	24 data (3/data), 0^h - 23^h

The Chairman will furnish lists of addresses to all participants. Brest harmonic constants from 1972 data and observed hourly heights spanning the intercalibration exercise period will also be furnished.

All participants may analyse all data if they wish but the following commitments were made:

Cartwright will do a response analysis of all data.

Demerliac will do a harmonic analysis of all data.

Zetler will prepare a combined plot of all data.

Hyacinthe will prepare a final report on all instruments and mooring techniques including any available information on cost of parts and their source.

Note: Although the Group agreed at the meeting that only one pressure series from each capsule should be analysed for the intercomparison, it was later agreed between the Chairman and other members present on the recovery cruise that where more than one sensor is attached to a capsule they should all be included in the intercomparison (unless obviously deficient in some way) and copies of the data sent to Cartwright, Demerliac and Zetler as above. The data should be sent to all participants by 1 April 1974. A three day meeting in Brest in September 1974 is proposed to complete the Working Group's report on the entire exercise.

(c) The analysis exercise is to be extended as indicated in the workshop report. Cartwright will distribute two series of hourly heights, 31 days each, edited and drift removed, by 1 January 1974. Participants will analyse series X (a 29 day series and the first 15 day series) to predict for series Y, get residual variance and, if possible, residual variances in the tidal bands, 1 cpd $\pm 4\frac{1}{2}$ cpm and 2 cpd $\pm 4\frac{1}{2}$ cpm. Similarly, series Y will be analysed to predict series X and residuals calculated. The 1-year IHB harmonic constants for Lerwick were distributed at the meeting.

The results of these analyses will be sent to Radok by 1 April 1974. He will distribute a summary well before the September meeting.

2. National reports on progress and plans for future.

Zetler reported on the one-year capsule being developed by Snodgrass and indicated that no decision has been reached on a deployment site. It was suggested that an anti-amphidrome (as described at the Venice meeting) might be considered. Munk, Hendershott and Zetler have proposed a satellite global tide programme to NASA in conjunction with GEOS-C (Dohler commented that his group is negotiating with NASA on a related programme using his gauges for ground-truth and for reference purposes). Zetler briefly summarized CICAR developments by AOML, NOAA, including a six-month series of pressure measurements near an amphirdrome in the Caribbean and a three-month series in the Gulf of Mexico that resolved a problem on continuity calculations for the K_1 tide.

Dohler reported that five gauges have been deployed successfully on both Atlantic and Pacific coasts. The shelf observations were obtained in conjunction with land-based gauges and have been analysed. A gauge was laid on the Denmark Strait but malfunctioned. The gauges will be used for the GEOS-C satellite experiment for one year at a depth less than 200 m and less than 100 miles from the coast. Mean sea level will be used for geoid determination and ERTS will be used for data transmission. Dohler reported that Aanderaa is building a deep-sea tide gauge costing less than $10 000 (US).

Radok reported that his capsules have not been used.

Schott's report had three main points. (1) Existing gauges (type Graafen) are being used in shallow waters in combination with current meter moorings. A German company making tests with new sensors has resigned and no replacement has been selected. (2) Cross-spectral analysis of current data with other parameters such as temperature in being done to separate barotropic and baroclinic tidal currents. He described areas of moorings in the OVERFLOW region and at the NW-African shelf. (3) Schott reported on plans for ITEX (internal tide experiment) west of Portugal. A PRE-ITEX is scheduled in the Iberian Basin for January 1974.

Teramoto wrote that the future plans of the Ocean Research Institute includes work on deep-sea tides.

Voit reported that theoretical investigations are continuing. These include a Poincaré solution of tidal equations assuming constant f, a stratified ocean and a turbulent bottom layer. A list of papers had been distributed to the Working Group in 1972. The USSR is starting development of a deep-sea gauge at the Institute of Oceanology, Moscow. Voit will arrange for the test tide analysis to be done at the Hydromet Office. He plans to work with Radok in the Lake Baikal experiment.

Cartwright reported that tidal work previously done at Bidston and Wormley will be combined at Bidston with Cartwright as head. There is a commitment to work on tides in the ocean as well as on the shelf; most of their present gauges (about 12) are shallow-water but a deep instrument has recently been designed. Plans include measurements out to and along the mid-Atlantic ridge. He has completed his programme of pressure and current measurements round the northern shelf edge from Ireland to Norway, including a special survey of the Shetland area. He hopes to continue the chain from southern Ireland to Brittany in the near future. Some year-long tidal recordings are now being made at strategic coastal sites west of Ireland. Observations near a supposed amphidrome in the Faroes showed a larger M_2 tide than might have been expected.

Hyacinthe presented his report on "Budgeting aspects of a possible global tide survey". The programme suggests 250 tide stations of one year duration, tied in with altimetry, using 25 deep-sea gauges (with mooring) over a ten year period. At $20 000 each, the equipment cost would be $500 000. A boat for deployment and recovery of the gauges is proposed. It would be about 25 m long and carry a crew of 3 or 4 (scientist, captain and technician). Equipped with both sail and motor, it would cost about $500 000. The scientific equipment, computer, etc. would also cost about $500 000. The cost of salaries, maintenance, fuel, etc. for ten years would cost about $1 500 000. Therefore, about 250 stations would be obtained for a total cost of $3 000 000, or about $10 000 per station. Advice would be needed from theoreticians on deployment sites. There was considerable discussion concerning the ability of a small crew to operate effectively and with respect to the proposed one-year at each site. It was suggested that it might be necessary to demonstrate other geophysical benefits to obtain this level of support. There may be problems in getting permission to fund one ship under international auspices. It would be useful to tie-in such a programme as complementary to the space altimetry programme. The Chairman thought it was important to consider realistically how much the real objectives of the Working Party would cost on the smallest possible budget, as Hyacinthe has

done. He also thought that half the battle for funds would be won if a team of keen scientists actually undertook to carry out the proposed programme if funded.

3. Reports on tidal work assosiated with MODE, OVERFLOW and GATE.

Zetler reported on MODE. Five UCSD records were obtained from three gauges for periods ranging from a half-month to two months. Data have been analysed referred to Bermuda complex predictions but it may be well to consider fewer time lags in the analysis, particularly for the shorter series. The experiment provides unique possibilities to examine instrument response (two sensors together) and to relate nearby tide observations in the deep sea.

Cartwright reported that the OVERFLOW exercise included some tidal measurements between the British shelf and Greenland. He has undertaken to collate all of these tidal data.

In GATE (international experiment in the Atlantic between 0° and 17°N), some tidal measurements may be made by Bidston (Cartwright) and NOAA (Mofjeld).

FGGE (First GARP Global Experiment) is in the planning stages for 1976.

4. Possibilities of Data Bank or Inventory for New Data and for Harmonic Constants.

The future role of IHB is not clear and some consideration is being given to IHB seeking another agency, possibly Bidston, to perform the data bank service. No deep-sea tidal constants have yet been sent to IHB but Cartwright will send his collected results from IOS shelf sites soon. Note - Some additional comments and suggestions on this subject appear to be unnecessary based on a very recent communication from the Chairman indicating preliminary negotiations have been initiated for IHB to transfer responsibility for storing tidal harmonic constants to Bidston.

5. Future Activities of Working Group No. 27.

In addition to preparing a report on the intercalibration exercise and the extended analysis workshop at the proposed meeting in Brest in September 1974, consideration will be given to studies involving the dissipation of tidal energy through internal waves at tidal frequencies.

It was suggested that it was desirable that a Working Group No. 27 meeting be included in the IAPSO 1975 meeting in Grenoble, as well as the meeting in Brest in September 1974, mentioned on page 44.

ANNEX VI

SCOR WORKING GROUP 28 (with IAPSO and IAMAP)
AIR-SEA INTERACTION

Report of fifth meeting, Melbourne, 23 January 1974

Present

H. Charnock (Chairman)
J. Namias
A. M. Oboukhov (representing L. R. Zwang)
C. H. B. Priestley
R. W. Stewart

By invitation

Pollard, Woods, Ostapoff, Pond, Dyer, Mitsuta, Franceschini, Laevastu, Coantic, Anderson, Hamon, Toba, Wucknitz, Yaplee, Valenzuela, Halpern, Golitzin.

The meeting started with a tribute to Karl Brocks, member of the Committee, who had died since the Moscow Assembly.

1. Apologies for absence

Apologies for absence were received from K. Bryan, S. S. Zilitinkevich and L. R. Tsvang.

2. Minutes of the last meeting

The minutes of the fourth meeting, held in Moscow on 1 to 7 August 1971, were read and agreed.

3. Matters arising

It was noted that the air-sea interaction symposium at Melbourne had included many papers on the upper layers of the ocean and on long-term (synoptic and climatic) interactions. Relatively little attention had been paid to the change of gases between the atmosphere and the ocean.

4. Membership

There was a general discussion on this subject but it was agreed that any action should be left until the Plenary Session of IAMAP and IAPSO at the XVI General Assembly, when changes to the membership would be recommended to the Associations.

5. Intercomparison trials

No arrangements had yet been made for instrument trials in Australia: Dr Dyer agreed to consult interested parties and to report progress.

The proposed intercalibration of airborne instruments would to some extent be replaced by the work to be done in connection with GATE. Nevertheless some of those present felt that further comparisons were desirable and agreed to take advantage of any opportunity which presented itself.

6. Transfer of gases between atmosphere and ocean

As reported in (3) above it had not been possible to arrange a symposium on this subject. Much work remained to be done on the interfacial layer but the practical and theoretical difficulties were considerable. It was suggested that progress might be more rapid if oceanographers and meteorologists were better acquainted with the chemical engineering literature. Several of those present expressed an interest in following up this possibility especially in connection with laboratory experiments.

7. Air-sea interaction in relation to ocean circulation projects

Discussion on this topic was postponed to a later meeting.

8. Air-sea interaction in relation to GATE, FGGE, etc.

Professor Woods gave an account of the proposals for oceanography and for atmospheric boundary layer work in GATE, drawing particular attention to the need for efficient data management.

Professor Stommel had prepared a JOC/SCOR information letter about oceanographic programmes during FGGE drawing attention to the suitability of the Indian Ocean monsoon for testing ideas about the oceanic response to seasonal atmospheric forcing. There was considerable interest in proposals described by Dr Halpern for studying upwelling in the Arabian Sea. There were plans for pilot experiments and it was hoped that these would be borne in mind in making the arrangements for MONEX.

It seemed likely that FGGE would include some relatively simple buoys, measuring sea-surface temperature and surface pressure, mainly in the Southern Oceans. These could perhaps be used to measure currents in the upper mixed layer of the ocean.

9. Air-sea-land interaction

Dr Laevastu gave an account of the work on cyclogenesis off Punta Arenas and Dr Mitsuta reported on the plans for AMTEX. The first phase was to take place in February 1974 and the second a year later.

It was readily agreed that the exchange processes in these areas where cold dry winds flow from land over warmer seas were very important. The difficulties involved in studying them were recognized but the meeting wished to recommend increased observational and theoretical attention to the problem.

10. Air-surface interaction in relation to seasonal and climatic change

Dr Namias gave a valuable review of progress in this aspect. Both he and the meeting were gratified at the increased attention being paid to it, as evidenced by the Melbourne symposia.

He gave an account of the NORPAX project, a 10-year endeavour to understand how anomalies of sea-surface temperature and the corresponding oceanic heat storage react on the atmosphere to affect its long-period variation. He referred to the phenomena, experiments and models, pointing out the importance of relating the processes in the atmospheric and oceanic boundary layers to the large-scale motions.

Dr Halpern reminded the meeting of the scientific and economic importance of the El Niño problem, pointing out that coastal upwelling was an important component of the NORPAX problem. The meeting recognized the relevance of such studies to the second GARP objective.

11. WWW and IGOSS

There was some discussion on the discontinuation of some Ocean Weather Ships in the western North Atlantic. The future of those in the eastern North Atlantic was under discussion.

The meeting was informed about the IGOSS pilot project for bathythermograph observations. It seemed likely that both WWW and IGOSS would wish to have sea-surface temperature charts on a synoptic basis.

12. Future activity of the Committee

It seemed clear that one major aim of the Committee, to foster research on air-sea interaction, was no longer needed: there was a lot of activity ranging from large international projects to individual researches.

The need now appeared to assist in selecting projects which would most illuminate the relevant physical processes and in ensuring that data were collected, processed and stored so as to allow their wide use not only by the group by whom they had been collected.

Dr Pond pointed to the need for a collection of case histories of thermocline development in relation to varying weather conditions. This was an example of data which were, in principle, available but which in practice were difficult to assemble because of differing data-banking procedures.

Dr Priestley reported that the WMO project on historical sea-surface temperatures was still in progress: this may be another data set which would be widely used if it were readily accessible.

13. Any other business

The Committee recorded its thanks to the University of Melbourne and to the Organizing Committee of the IAMAP/IAPSO Joint Assembly for making the meeting facilities available.

14. Date of next meeting

The next meeting would be held in association with the XVI General Assembly of IUGG at Grenoble in August/September 1975.

ANNEX VII

OCEAN CLIMATE PANEL OF WG. 34

Oceanographic Basis of Ocean Monitoring and Prediction Systems
Report of Meeting on 20 October 1973

The first meeting of the SCOR WG 34 Panel concerned with Monitoring Global Ocean Climate took plate on 20 October 1973 during the Ocean/Atmosphere Climate Workshop (Session 2) in Victoria, British Columbia. Four members of the Panel (Dickson (Chairman), Namias, Smed, Tabata) were present, while the fifth member (Hupfer) communicated his views by mail.

Our brief was to determine the oceanographic basis for the ocean monitoring and prediction systems of the future and specifically, to explore the feasibility of monitoring large-scale, long-period variations in ocean climate. Throughout our discussion we were conscious of the fact that if our recommendations were to be implemented, they must be concerned with specifics rather than with vague generalisations; similarly it was clear that the techniques involved should be practical and relatively inexpensive rather than over-sophisticated or futuristic. Thus although all members of the Panel were aware of what an "ideal" monitoring system would involve, we have concentrated on the one basic aim of providing time-series of a few essential hydrographic and meteorological parameters from fixed locations, globally distributed, in order to describe the long term climatological means of these parameters and their monthly deviations from "normal".

Reviewing the many possible approaches to this objective, the following were thought to be the most fruitful:

(1) The establishment of a "Phantom Weathership" network. Over the past 25 years the Ocean Weather Stations of the Atlantic and Pacific sectors have constituted the most complete data base for the study of ocean/atmosphere variation in open ocean areas. However the expense of maintaining these stations has now brought about a drastic reduction in the network and although data buoys have been suggested as replacements these will also be expensive to maintain, even in limited numbers. Certainly they do not offer a solution to the problem of data collection over the great expanse of tropical and southern oceans. Over the majority of the world ocean our knowledge of ocean climate variations is based largely on data collected by the commercial ship sampling programmes of WMO and others but from the point of view of our Panel this data-collection is currently too random in space and time to establish the fixed-point time-series which we require. It is the view of the Panel that without disrupting the current commercial ship sampling programme, a part of this sampling effort could be reshaped to provide a constant frequency of sampling at fixed locations, and at low cost. Our rationale is as follows: In world shipping there exist a number of major companies operating large fleets of bulk carriers (tankers, ore carriers) which operate between fixed points of supply and demand. Accordingly they occupy relatively fixed routes at a rather constant frequency, and for this reason this type of bulk carrier is ideally suited to the type of observational programme which we require. In essence we plan to identify each major fleet in this category, whether or not they are currently contributing ocean data, and for each fleet we will then seek to identify the precise routes and traffic frequencies worked by their vessels. Initial enquiries with three major fleets (Shell, B. P. and Exxon) have shown the existence of several routes worked by each company at a frequency of over 6 voyages per month; it is clear that if a sufficient number of these routes can be identified globally and if observations can be arranged at carefully chosen points along these routes and at a frequency of 6 observations or more per month we are approaching the type of fixed-point data collection networks which the weatherships used to provide, (but in this case on a global scale). The location of each site will be critical since no major carrier will agree to divert its vessels from their preferred route; thus while each station should be located in a hydrographically critical or representative site, the normal routing patterns of vessels (current routing, weather routing etc) must also be studied in detail if the system is to be practicable. In addition as we currently envisage the scheme, each major carrier will be responsible not for a chain of globally distributed stations (which would impose impossible restrictions on the navigation of their vessels) but for one or two stations only which they alone would occupy and located at the most favoured location along their most travelled route. Thus from 50-100 major

bulk carrier fleets we would plan a global network of perhaps 100 stations. So far the Panel has concentrated on identifying suitable fleets from Japan alone but already some 50 potentially suitable fleets have been identified, some running in sparsely sampled areas (Japan - South America or Japan - Australia for example). As regards cost the Panel sees no reason why the major fleets should not be persuaded to bear the relatively minor cost of instrumentation themselves. The oil industry is extremely sensitive to public opinion on environmental issues; put crudely if they are able to show that they are taking on the job of environmental monitoring at a time when the developed nations are running down their ocean station networks then the publicity trade-offs will far outweigh the cost of an XBT launcher and probes for each of their vessels. As regards the parameters to be sampled, the Panel is open to advice from potential users but perhaps the minimum program should involve XBT, surface temperature and salinity, the normal meteorological parameters and solar radiation measurements. At present the Panel sees its job as being to investigate the feasibility of setting up such a globally distributed network of fixed-point ocean data stations. If this proves feasible then it would recommend (through SCOR) that this programme be incorporated into the current WMO programme which already possesses the means to gather and distribute the data. It is perhaps relevant to add that in the opinion of the Panel, such a scheme must form the basis of any programme aimed at successfully monitoring the ocean climate on a global scale. For reasons of cost we must use commercial shipping to make the necessary observations. To establish an adequate data base we must obtain these observations at fixed locations. For these reasons the description of this one item of the Panel's work programme is given the greatest emphasis in this report.

(2) Extension of the tide gauge network. As Wyrtki has made plain in his recent studies, even a sparse network of tide gauges can provide useful and meaningful estimates of ocean current variations. Sus Tabata is currently compiling an inventory of tide-gauge data and this will be used to identify those locations where the network could usefully be expanded.

These two items will constitute the bulk of our initial work programme but during this phase of the Panel's work we will also give attention to the following problems which we think are of importance:

(3) The rescue of time-series in distress. Recognising that an existing time series of ocean data is a valuable asset we plan to be on the lookout for time series which are in danger of abandonment in the hope of urging their continuation. By this we do not merely mean the diminishing ocean weather station network; there exist many cases where hydographic effort has been carried out in a fixed location for a decade or so, only to be abandoned as research interest moves on to a different area. As one example we may cite Blindheims 10 year data series of hydrocasts in April in the Davis Strait, abandoned in 1969/70. In inacessible areas stations worked in a single month of successive years can be extraordinarily valuable, especially if (as in this case) they were sited in a critical area. As another example we may cite ultra-deep stations in critical areas where trends of change are slow and where an irregular history of past observations can be raised to the status of a time-series with little additional effort.

(4) The Climate Clinic concept. It was an early view of C.G. Rossby that the science of ocean/atmosphere interaction would benefit from the establishment of a centre where there would be access to data and computing facilities and where routine analyses of hydrographic and atmospheric data would be carried out and discussed with a view to isolating central research problems. Such a centre, perhaps attached to an established

institution, would have its own core staff of air/sea interaction scientists, but (perhaps more important) would permit visiting scientists to attend for period of some 3 months to 1 year. It is the opinion of the Panel that the interchange of ideas resulting from such a programme would advance our knowledge of ocean/atmosphere behaviour and should perhaps be a long term objective of our Working Group.

(5) Housekeeping. Since the Panel has recently met to discuss its initial work programme, no further meetings are planned for 1974 and no financial support will be required from SCOR.

(6) Additional Panel Members. The Panel has already received valuable support information from Dr Hayato Iida, T. M. A. Tokyo, would welcome his inclusion as a member, and seeks the approval of the SCOR Executive and of our own parent Working Group to this suggestion.

ANNEX VIII

THEORETICAL PANEL OF WG 34

Oceanographic Basis of Ocean Monitoring and Prediction Systems

Report of Meetings, Australia, January 1974

A. SESSIONS

I	Melbourne	23 January 1974	(afternoon)
*II	Melbourne	23	(evenings)
III	Melbourne	24	(afternoon)
*IV	Canberra	28	(afternoon)

* Indicates joint meeting with WG 38.

B. PARTICIPATION

Members

L. Fomin	USSR	I	II	III	-
A. Gill	UK	I	II	III	IV
K. Hasselman	FRG	I	II	III	-
A. Robinson (Chmn)	USA	I	II	III	IV

Invitees

L. Brekhovskikh	USSR	I	-	III	-
H. Charnock	UK	I	-	III	IV
W. Holland	USA	I	-	III	-
G. Needler	Can	I	II	III	-
W. Schmitz	USA	I	II	III	IV

For WG 38					
D. J. Baker	USA	-	II	-	IV
B. Ekov	USSR	-	II	-	-
Sir G. Deacon (Chmn)	UK	-	II	-	IV
V. Neal	USA	-	II	-	IV
Additional					
F. Anderson	S. Af.	-	-	-	IV
K. Bowden	UK	-	-	-	IV
T. Gaskell	UK	-	-	-	IV
R. Pollard	UK	I	-	III	-
D. Rochford	Aus.	-	-	-	IV
G. Siedler	FRG	-	-	III	-
R. Stewart	Can.	I	-	-	-

C. DISCUSSION TOPICS

1. Dynamics of Mod-Ocean Eddies: (Sessions I, & III) In accordance with the initial specific charge to WG 34 ".....,to consider the desirability and possible design of a mid-ocean dynamics experiment....." this topic, which was the subject of a Recommendation adopted at our 1971 Moscow meeting (SCOR Proc. Vol. 8 No. 1) and also discussed at our 1972 Boulder, Colorado meeting, was discussed and a general Recommendation (see below) was adopted at the end of Session III.

As requested by the SCOR Executive on an ad hoc basis, two additional topics were considered.

2. Dynamics of the Antarctic Region: (Sessions II, & IV) A Recommendation (see below) was adopted at the end of Session IV.

3. An Oceanographic Programme for FGGE (The First GARP Global Experiment): (Sessions II, & III) The following Recommendation to the SCOR Executive was adopted at the end of Session II.

(1) The timely, fundamental, and practically important problem of the Dynamics of Climate (The 2nd GARP Objective - "improving our understanding of the physical basis of climate") necessarily involves special oceanographic as well as meteorological studies, and particularly requires the development of coupled ocean-atmosphere models and coordinated joint air-sea experimental studies.

(2) Because of the commonality of many specific scientific objectives and the large effort and investment required in their pursuance, a strong interaction between the oceanographic community, including its burgeoning activity in large experiments (e. g. NORPAX), and GARP is desirable; in particular.

(3) It is recommended that a special SCOR Working Group be established to develop plans for a comprehensive oceanographic programme for FGGE, and note:

(a) the immediacy required in order that the requisite joint oceanographic-meteorological input may enter FGGE planning at an early stage.

(b) that the Global Coverage of meteorological parameters, especially the improvement during FGGE in the southern hemisphere, suggests that the following major possibilities for oceanographic experimentation be considered.

i) Dynamics and Response of the Southern Ocean

ii) In light of the relatively short oceanic equatorial time scales, the Dynamics of Equatorial Currents and Waves (Indian, Atlantic, Pacific).

iii) Large Scale Upper Layer Dynamics.

iv) The Monitoring of appropriately identified Indices of Variability (e. g. Current Transports).

(c) that the desirability and feasibility of exploiting or modifying for oceanographic purposes the large number of proposed surface free drifting buoys should be considered.

4. Dynamical Considerations within SCOR: A discussion of the organization within SCOR WG's required for the effective consideration of dynamical problems naturally arose and recommendations (a WG for Internal Dynamics of the Sea, for Coupled Air-Sea Dynamics, and a mutual Sub-Group on Numerical Modelling both WG's to concern themselves necessarily with aspects of the Antarctic dynamics) were reported to the SCOR Executive verbally in detail in Canberra on 29 January.

C. RECOMMENDATIONS

It is hoped that the following may be published and publicized so as to encourage international participation in these important programmes.

I. Mid-Ocean Dynamics Experiments· POLYMODE

1. The critical Importance of the low frequency Eddy-scale (mesoscale or oceanic synoptic scale) for the dynamics of the general circulation of the open ocean has been established by the results of recent investigations including, (i) the low frequency analysis of the POLYGON Experiment, (ii) the results of MODE-O and the preliminary analysis of MODE-I data, (iii) evidence from initial researches into historical data which indicate the widespread geographical distribution of the phenomena.

2. The scope of the Eddy phenomenon and its characteristic scales in space and time are such that a large and necessarily International Effort is required for its investigation. The next major field experiment POLYMODE is scheduled for the western North Atlantic in 1976; fully international cooperation in its planning and execution is strongly encouraged.

a) Accomplishment of the Scientific Objectives of POLYMODE should provide a significant advancement in understanding of the dynamics of the phenomenon and should include feasible aspects of Energy transformations in the deep sea involving the Eddy-scale motions, Eddy production mechanisms, Eddy-Eddy Eddy-Mean Field Interactions, and

b) International Cooperation in the investigation of the geography of the phenomenon is essential. A number of small individual efforts (e. g. isolated

moorings and small arrays, closely spaced along XBT tracks) are required to map the distribution of eddy energy and scales over the vast reaches of the worlds oceans.

3. The increased knowledge of the eddy phenomenon afforded by both the increased data base and the results of modelling efforts provides a basis for improved and more extensive numerical modelling. Such models should play a critical role in the design and interpretation of POLYMODE and of future Mid-Ocean Dynamics Experiments.

a) Communication between the modelling groups concerned with eddy processes and those concerned with other isolatable special dynamical processes and specific oceanic regions should be effectively maintained in order to allow for as rapid as possible a construction of a dynamically correct comprehensive general ocean circulation model.

II. Antarctic Dynamics

1. The Importance of physical oceanographic studies in the Antarctic Ocean is recognized because:

a) of the many regional phenomena which are dynamically interesting and complex. Included are the Antarctic Circumpolar Current which links the Southern oceans, deep convection which is the origin of more than half the world oceans' deep water, and exchange processes involving air, sea and ice which influence the energy balance of the polar heat sink. Many aspects of the physical processes involved in these phenomena may typically occur elsewhere in the worlds oceans.

b) of the role of the Antarctic circulation in the General Circulation of the worlds ocean and its probable influence on the atmospheric global circulation.

c) of the practical benefits associated with increased knowledge such as the prediction of local weather, sea and ice conditions, exploitation of the regions high biological productivity, and climatic modelling.

2. On account of the importance of the region, the present lack of understanding of process, and the availability of modern observational techniques it is recommended that an International Cooperative Programme of Exploratory Experimentation be carried out now in the Antarctic Ocean. This experimentation, such as that planned by ISOS (International Southern Ocean Studies), should:

a) be addressed to the definition of

i) the scales of variability in space and time

ii) specific physical processes, associated with the phenomena.

b) be associated with a related programme of theoretical/numerical modelling of the region and of processes.

c) serve as the basis for the identification and design of major Antarctic Experiments where and when feasible and necessary.

SCOR WORKING GROUP 35 — ANNEX IX

Methods in Quantitative Ecology of Coral Reefs

Report by Chairman

SCOR WG35 held a field meeting at the Heron Island Research Station, Great Barrier Reef, immediately following the Second International Symposium on Coral Reefs held on board m. v. Marco Polo in June-July 1973. Some members of the field meeting left the Marco Polo at its final stop, at Heron Island, on 30 June. Others travelled to Heron Island from Brisbane on 2 July. Most members left Heron Island on 9 or 10 July, some a little later.

All members of WG35 were present for the meeting: these comprised

Dr D. R. Stoddart (Cambridge, England), Chairman
Dr R. E. Johannes (Georgia, USA)
Professor K. Jonishi (Kanazawa, Japan)
Dr Y. Loya (Tel-Aviv, Israel)
Dr M. Pichon (Marseille, France)
Dr G. Scheer (Darmstadt, Germany)
Dr F. H. Talbot (Sydney, Australia)

In addition the Group was joined by thirteen other scientists, at their own expense, specifically for the purpose of this meeting. This greatly broadened the scope of the fieldwork and discussion. The additional participants were:

Dr Nurit Gundermann, South Pacific Commission, New Caledonia
Dr P. Hutchings, Australian Museum, Sydney
Dr D. W. Kinsey, Mauri Bros. and Thompson, Sydney
Dr D. Kühlmann, Humboldt Universität, German Democratic Repulic
Dr E. Lovell, University of Queensland, Brisbane
Dr J. Marsh, Marine Laboratory, University of Guam
Dr J. Porter, University of Michigan, USA
Mrs K. Porter, University of Michigan, USA
Dr B. Russel, Australian Museum, Sydney
Dr H. Schuhmacher, Ruhr Universität, Bochum, Germany
Dr B. Thomassin, Station marine d'Endoume, France
Mrs C. C. Wallace, Queensland Museum, Brisbane
Dr M. Wijsman-Best, Rijksmuseum, Leiden, Netherlands

The Group conducted fieldwork on the reefs of Heron Island and on other nearby reefs during the day, and held seminars and discussion meetings during the evenings. The fieldwork consisted of studying reef areas using alternative methodologies. In addition, several members were able to visit the field laboratory maintained by The Australian Museum on One Tree Island, and observe its reef, by invitation of the Director, Dr Talbot.

The meeting was immensely successful for all those who took part in it. It was aided by the opportunity to hold preliminary meetings on board the Marco Polo during the Symposium beforehand, but especially by having available the facilities of the Heron Island Research Station, made available by the Director, Dr K. Rohde, and also the assistance in organization of communications and supplies of Dr B. Russell of The Australian Museum. The Group wishes to thank the Heron Island Board, the Director of the Heron Island Research Station, and Dr Russell for this very great assistance which was much appreciated.

The purpose of the meeting was to plan the production of a Handbook of Coral Reef Research methods, and to investigate the relative efficiencies of different techniques and, in the Handbook, to make recommendations. In addition to those present at the meeting, a variety of other authors have been asked to contribute sections to the Handbook. This is under the general editorial direction of Dr Stoddart, with substantial delegation to Dr Johannes (on sections concerning energy and nutrient flux) and to Dr Talbot (in fish). Some sections of the Handbook are already written. Before the Heron Island meeting, discussions had taken place concerning publication. No final plans have been made, but the Group considered it necessary to ensure an appropriate outlet for a volume of this sort with the range of illustration in plates and figures likely to be required.

It is also proposed that work begin on a multilingual dictionary of reef terminology, to be produced by Dr Stoddart, Dr Pichon, and Dr Scheer (covering the English, French and German languages). It was felt that Russian should be added but that no contributor was immediately available. Dr Stoddart agreed to produce and circulate a draft of English terms during 1974.

It was agreed that once the Handbook had been produced the work of the Group had ended, and the Group should at that time be disbanded. The Reef Terminology project would presumably then be continued by the editors as a separate venture, unless SCOR wished to prolong the life of the Group for that purpose.

The Group therefore wishes to recommend that it continue in existence until its report is published, with the possibility of an extension to cover the completion of the terminology project. It is not envisaged that any further Group meetings will be required.

The members of the Group wish to thank SCOR for the financial support which made the Heron Island meeting possible.

ANNEX X

SCOR WORKING GROUP 40 - PALEO-OCEANOGRAPHY

Report of meeting Norwich, UK, 19-22 May 1973

WG 40 held its first meeting on 19-22 May, in Norwich, England, on the occasion of a conference on the paleoclimatology and paleo-oceanography of the last glaciation and subsequent times. Members present at the meeting of WG 40 were Imbrie, Lamb, Shackleton, Takanayagi and van Andel; absent were Seibold and Lisitzin. Drs Hays, Gates, Webb, van der Hammen and Collinson attended as observers.

The first part of the meeting was dedicated to an exploration of the framework within which the Working Group will operate. Subsequently, and with the aid of the presentations at the Conference, the group explored the present strength and future development of the field of paleo-oceanographic research.

In so doing, the group recognized the following aspects of this rapidly developing field:

(1) the strongly interdisciplinary nature which requires close cooperation of such diverse specialists as marine geologists and paleontologists, physical oceanographers, numerical moddlers in both oceanography and climatology, meteorologists and climatologists, palynologists, glaciologists, Quaternary geologists and tree-ring specialists, as well as many others. The breadth of this spectrum provides exceptional opportunities for correlating and interpreting data from many fields, but also renders difficult the establishment of a full dialogue between scientists who have no traditional common meeting ground.

(2) the rapid development in recent years of mathematical and statistical techniques that have, for the first time, made it possible to quantify environmental parameters derived from the oceanic geologic record in a form suitable for input in dynamic models of the circulation of the ocean and atmosphere. By providing quantitative environmental data for past conditions, it is not only becoming possible to model the dynamics of past circulations, but also to test existing models of the present circulation with regard to their power of explanation.

(3) the availability of large data resources, both in raw and processed form and, conversely, the need for enlarging the data reservoir in certain areas.

(4) the significant social and economic implications of a better understanding of the sensitivity of ocean and climate to human interference and of long-term climatic trends, over a scale of a century or so, as they interact with projected economic and social developments.

For convenience, the area of the Working Group may be subdivided into two separate categories: the paleo-oceanography and paleoclimatology of the late Quaternary, and the paleo-oceanography of the past 50 million years or so. Realistically, at the present time, the paleo-oceanography of the Mesozoic and earlier times is not yet accessible to productive research. The Working Group devoted its first meeting mainly to activities in Quaternary paleo-oceanography, and will address the paleo-oceanography of earlier periods of the earth's history at its next meeting.

From a thorough discussion of the field, the group defined three most useful categories of activities: (1) facilitating interdisciplinary communication at the working level, (2) promoting the communication regarding methodology, opportunities, and results in paleo-oceanographic research in the community-at-large, and (3) assisting, by means of recommendations to appropriate international bodies, in increasing the reservoir and accessibility of needed primary date.

As regards the first category, the Working Group proposes the following:

(1) to explore the feasibility of organizing in the USSR a workshop on paleo-oceanography and paleoclimatology of the late Quaternary. This meeting, however, is dependent on USSR confirming a representative on WG 40.

(2) to organize and locate support for a small technical workshop on mathematical and statistical models that permit quantification of environmental data from the geological record for use in dynamic circulation models.

With respect to the second category;

(3) to organize and convene a Symposium on paleo-oceanography at the Joint Oceanographic Assembly in Edinburgh in 1976 as proposed by CMH and agreed by JOA.

(4) to prepare a draft of a report for general distribution in the oceanographic community detailing the opportunities, problems and methodologies of paleo-oceanographic research, illustrated with appropriate examples and a selected bibliography, to be issued preferably under sponsorship of SCOR.

Under the third category, the group formulated several recommendations which it wishes to have considered by SCOR for forwarding to appropriate international bodies for their attention: these will be included in the report mentioned in (4) above.

ANNEX XI

SCOR WORKING GROUP 41

Morphological Mapping of the Ocean Floor

Status Report 3 January 1974
A. S. Laughton (Chairman)

No further meetings have been held since 2 and 3 April 1973, after which a report dated 1 May 1973 was written, containing recommendations for a new organization for the preparation of a world series of bathymetric charts. After endorsement by the SCOR Executive in Texel, the report was forwarded to the Director, IHO.

On 5 and 6 June, the ICSU/IHB/IAPSO GEBCO Committee met in Monaco to consider the future of the GEBCO 1:10 million scale chart series and discussed in particular the report of the SCOR WG 41. The following formal recommendations resulted from the meeting:

"1. The GEBCO Committee recognizes the role played by the IHO as a centre for bathymetric data and invites that organization to continue and to develop further this activity which is essential for the GEBCO programme.

2. The GEBCO Committee recognizes that the present GEBCO series at 1:10 million no longer meets present needs of oceanographers. The members feel that a new series should be undertaken, along the general lines of the recommendations of SCOR WG 41 dated 1 May 1973. It recommends particularly that:

(a) a Guiding Committee for the new General Bathymetric Chart of the Oceans be formed by the IHO and the IOC after consultation with SCOR, IAPSO and the CMG. This Committee, which would replace the existing GEBCO Committee, should meet at the earliest possible opportunity and in any case prior to 1 April 1974,

(b) the necessary financial support for publication of the new series shall be sought without delay. The amount required is estimated at 300.000 FF. per annum and includes (i) the salaries of a full-time unit assigned to compile the mock-ups of the sheets; (ii) the cost of draughting, printing and distribution of these sheets. It is estimated that this unit should produce four sheets per year,

(c) appropriate scientific organizations are invited to table at the first meeting of the Guiding Committee mock-ups of the new chart illustrating the way in which each considers it ought to be prepared and which adhere to the recommendations made by SCOR WG 41,

(d) a careful enquiry should be conducted regarding the possible users of the new chart and potential users should be specificlly questioned as to the value they attach to this chart.

3. The GEBCO Committee recommends to the IHB that work on the 1:10 M series in its present form should be suspended pending the institution of a new series and that the IHO should be invited to terminate the contract with the IGN for the fourth edition. The GEBCO 1:1 M plotting sheets should continue to be updated since, at the present time, these constitute the format for the distribution of bathymetric data for which the IHO is responsible.

4. The GEBCO Committee recommends that its two sub-committees, on Geographic Names and on Nomenclature of Ocean Bottom Features, be combined to form an advisory committee to the IHO.

5. The GEBCO Committee considers that the IHB should take action to ensure that appropriate experts are included in the UN Group of Experts on Maritime Nomenclature. The Committee recommends that the IHB give the matter urgent priority.

6. The GEBCO expressed its grateful thanks to the Institut Geographique National and in particular to the Director, Ing. Gen. G.R. Laclavere, for the work carried out up to the present in the preparation and publication of the present edition of the GEBCO.

7. The GEBCO Committee expresses its thanks to the Principality of Monaco for the financial and other assistance provided to the IHB which has played an important part in ensuring the continuation of the GEBCO.

8. The GEBCO Committee thanks the President of the IHB for providing assistance to the Committee and for hospitality on the occasion of the last meeting of the Committee."

In Autumn 1973, the new GEBCO Guiding Committee was set up by IOC and IHO in consultation with SCOR, IAPSO, and CMG and the following names have been suggested to represent the oceanographic side:

A. S. Laughton (SCOR)
B. C. Heezen (IAPSO)
E. S. W. Simpson (CMG)
G. B. Udintsev
W. Langeraar

The Guiding Committee is scheduled to meet in Paris from 25 to 27 April 1974.

The setting up of a full time Geoscience Unit to undertake compilation and contouring work is dependent on the necessary funds being made available. This matter is in the hands of IOC and has not yet been resolved.

In the light of the above activity it is not planned to hold further meetings of SCOR WG 41 in the immediate future, but to await the outcome of the new organization. If this is effective it might be considered that the SCOR WG 41 has fulfilled its terms of reference.

ANNEX XII

SCOR WG 42 (with ICES)
STUDY OF THE POLLUTION OF THE BALTIC
REPORT OF MEETING 28/29 JUNE 1973
Kiel, FRG

Participants

Dr G. Kullenberg (Denmark) Acting Chairman

Dr Hans Ackefors (Sweden)
Prof. A. Aitsam (USSR)
Prof. B. Bolin (Sweden)
Dr H-J. Brosin (DDR)
Dr B.I. Dybern (Sweden)
Prof. K. Grasshoff (FRG)
Dr R.C. Griffiths (France)
Mr Aaro Haverinen (Finland)
Prof. Dr. G. Hempel (FRG)
Dr A. Lindquist (Sweden)
Prof. C.H. Mortimer (USA)
Mr H. Naeve (Italy)
Dr S. Nordström (Sweden)
Dr W. Slaczka (Poland)
Dr Erik Somer (Denmark)
Dr J-O. Strömberg (Sweden)
Mr Hans Tambs-Lyche (Denmark)
Mr O. Vagn Olsen (Denmark)
Dr A. Voipio (Finland)
Dr B. Weichart (FRG)
Dr L. Zmudzinski (Poland)

1. Opening of the Session

The Meeting was opened by Dr G. Kullenberg who on very short notice had been invited to act as Chairman by the President of ICES, due to the sickness of the Chairman, Professor I. Hela.

Mr H. Tambs-Lyche explained the procedure followed in this case and also noted the changes in members of the Working Group that had occurred.

A telegram was sent to Professor Hela regretting his sickness and wishing him a speedy recovery.

Professor G. Hempel welcomed the Working Group to Kiel on behalf of the "Institut für Meereskunde".

Dr J-O. Strömberg was elected Rapporteur of the Session.

2. Approval of the Agenda

Slight changes of the Draft Agenda were made. Thus changes of the terms of references for the Working Group (WG) were not discussed, since specific suggestions on redrafting were not yet available. Brief information on the continued cooperation between SCOR and ICES within the framework of the WG was added to Item 4.

With these minor amendments the Agenda was approved.

3. Presentation of Supplementary National Reports

Dr Slaczka gave a brief statement on the recent Polish achievements in Baltic research and on future plans. Two research expeditions are launched each year, one in May-June and the other by the end of August. During each of these, a large number of stations are visited in three areas 1) the Skagerak-Kattegat-Danish Sounds, 2) the central Baltic, and 3) the eastern Baltic. Plans are to include some stations also in the Bothnian Sea. At most stations samples of benthos, plankton, sea-water and sediments are taken. Analyses are made (partly on board the ship) on e. g. DDT, PCB, oils, oxygen content, heavy metals and standard hydrographical parameters. Sensitivity tests of pollutants on some organisms (e. g. Asellus, Mesidothea, Crangon, Neomysis) have also been performed showing Neomysis most and Mesidothea least sensitive to changes. A national report was received from USSR.

The Danish delegation reported that considerable means have now been made available for a major study in the Danish Sounds of the water and matter exchange between the North Sea and the Baltic. With the present progress the observational programme will start during 1974.

The Finnish delegation informed about ongoing cooperative work in the Gulf of Bothnia and the Aland Sea, where current measurements and other physical as well as chemical observations are made.

4. Information on the "Conference on the Protection of the Baltic" and ICES/SCOR Cooperation on the Baltic Pollution Problems

a) A meeting of Government experts for the preparation of the Baltic Conference on the Marine Environment was initiated by the Finnish Government and positively accepted by all countries bordering the Baltic. The first meeting was held at the end of May - beginning of June 1973 in Helsinki. A second meeting will be held in Helsinki at the end of November 1973, and the Conference itself will meet by the end of March 1974.

As to the need for scientific advice, 2 lines of ideas had been forwarded:

1) that ICES together with other interested organizations give all required advice within their competence and possibilities

2) a new body is set up.

Mr Tambs-Lyche informed that the Bureau of ICES had decided to offer the services of ICES to the Conference, if it should wish to make use of them.

Dr Mortimer noted the parallel with the pollution studies in the Great Lakes, where a separate scientific body had been set up. The experience therefrom is available.

b) Mr Tambs-Lyche and Professor Hempel informed that SCOR has so far no intention to withdraw from the cooperation within the framework of the present WG. The pollution studies of the Baltic will be a most valuable pilot project in this field and of great scientific interest. The fact that the German Democratic Republic might become a member of ICES in the near future does not change the basis for this cooperation.

5. Report on the Sampling and Analytical Capacities around the Baltic

A report on the responses to his questionnaire was presented by Professor Grasshof. He also reported that answers from two laboratories in the USSR had now arrived, giving a total of 27 answering institutes. The WG noted with great satisfaction the willingness of the different laboratories to participate in future pollution studies of the Baltic. Together they can cover the needs for analyses of all the different compounds which can be considered important during the initial study. One primary difficulty is the many methods used for analyses of single compounds, which call for intercalibration. A detailed knowledge of methodology and standards used by the various laboratories is essential for a successful base-line survey. This can be obtained in the following way:

a. analytical experts (preferably 2, one for heavy metals and one for organic constituents) should visit the various laboratories which have answered the questionnaire, in order to obtain direct information about the procedures for analysis used in the laboratories, thereby gaining much more information than is possible through correspondence only;

b. a meeting of analytical specialists should be convened before February 1974.

A recommendation to this effect was adopted by the WG (Recommendation 1). It was also stressed by the WG that it is desirable to increase analytical capacities in each of the Baltic countries, especially increasing the number of compounds that can be analysed in each country.

6. Report on the Sources of Input to the Baltic Sea

A progress report on the answers to the Questionnaire on inputs to the Baltic was presented by Dr Brosin. Answers had been received from 4 countries, Denmark, FRG, DDR and USSR, and an answer was presented at the meeting by Sweden.

The difficulties in obtaining satisfactory information concerning the input of certain materials such as nutrients and industrial input were noted. The great importance in obtaining input data was stressed and the necessity of continuation of this work was realised. Dr Brosin was asked to compile the incoming information. The Baltic countries are urged to provide as complete information as possible. The lacking answers will possibly be available by October 1973, and a full report early in 1974.

The WG noted the important plans presented by the Group of Experts on the Water Balance of the Baltic Sea under the National Committees for the International Hydrological Decade (IHD) at their second meeting. A close collaboration between that Group and the present WG on related subjects is necessary. Especially river discharge prob-

lems and the transfer of pollutants from the air into the water were discussed. A recommendation (No. 2) to this effect was adopted.

7. Discussion on the Monitoring of the Horizontal Extension of Anaerobic Conditions in the Baltic

The WG noted that the national efforts to monitor the horizontal extension of oxygenfree water in the Baltic were quite sufficient.

The exchange of data is, however, not fully satisfactory and the WG expressed the desirability that annual reports from these studies be submitted to "Annales Biologiques". These could be similar to the Swedish annual reports, which have been given national publicity during the last couple of years.

8. Report on the Research Programme for Investigation of the Baltic as a Natural Resource in view of Marine Pollution Problems

The outlining of a research programme for understanding the natural processes going on in the Baltic, and the formulation of specific tasks of limited endurance but which need the concerted efforts of all or most of the Baltic nations has been a major task of the WG. The Report of the drafting group was presented. [It has been agreed subsequently that this report will be published in ICES Cooperative Research Report series.]

The WG supports the general philosophy of the Report. It was stressed that the tasks listed in the Report are those considered to have a high priority in order to obtain an understanding of basic processes in the open Baltic. Thus projects involving long-time series of specific coastal problems are not dealt with. The projects are not meant to interfere with other projects in national programmes. The aim of the present suggested investigations is to provide the necessary scientific basis for an effective monitoring programme, which is envisaged to be established in the future in order to facilitate control and prediction of the current pollution situation in the Baltic. For predictions verified models are needed. The great advantage was realised of having working models which can give guidance to the observational programmes and be tested by observations. Considering the urgency of this matter the WG recommended that scientists engaged in modelling efforts of the Baltic and similar areas should have an opportunity to meet in connection either with the next Conference of the Baltic Oceanographers or the next Statutory Meeting of ICES in Copenhagen (Recommendation 3).

The WG noted that the semi-empirical approach, as for instance the Odum approach, is one way of modelling the environment which can be used at the present stage together with the purely theoretical approach. The ultimate goal is, however, to obtain dynamical models verified by observations.

Thereafter the tasks were discussed one by one, and recommendations to the Action Planning Group of the WG, which should meet on 30 June, were made. (See p. 68 for report of The Action Planning Group.)

Task 1: Exchange of matters and waters with the North Sea.
Means for starting this task are already available in Denmark and Sweden. Cooperation is necessary (Denmark, FRG, Sweden) and also with the North Sea Group (Norway, Denmark, Sweden).

Task 2: Open sea experiment.
The WG suggested that one area is chosen for concentrated efforts. Detailed measurements of density and current structure in the water column, together with sections of temperature profiles obtained by towing thermistor chains, may be one way of approach.

This task is important but detailed planning is required. The Action Planning Group was asked to make rough estimates of needed ship times, manpower etc.

The experience from the Lake Ontario study (International Field Year for the Great Lakes) can be a great help in the planning and conducting of this task.

Task 3: The Baltic circulation: development of an exploratory model followed by field observations.

The WG was of the opinion that an exploratory model could greatly help in achieving an optimum planning of the field observations. The model should be tested, if necessary further developed, and in the end possibly verified by the observations. The need for a meeting of people engaged in modelling has already been mentioned (cf. Recommendation 3).

Task 4: The lateral boundary layer dynamics experiment.
Major national efforts could be combined with international cooperation in the open sea. Available resources are, however, inadequate and additional funding is necessary. The Action Planning Group was asked to make an effort to estimate costs for shiptime etc., to choose suitable experiment sites and, if possible, to take the Great Lakes' study in consideration in the planning.

Task 5: Open sea multi-disciplinary continuous stations.
The Action Planning Group was asked to make estimates of needs in terms of ship time, manpower etc. Further designing of experiments will have to be made by a special scientific task group that will have to convene later.

This is an interdisciplinary task which definitely needs large ships and international cooperation. The character of this task as a process study (short time) was stressed.

Task 6: Biological productivity studies at fixed stations.
The WG decided that Professor Hempel and Dr Lindquist elaborate on the fish production problems to be included in this task. Until this is ready the Action Planning Group can do only little on this task.

Task 7: Determination of toxic substances throughout the food chain.
This task should follow the base-line study. The Action Planning Group, therefore, need not concern itself immediately with this task. The progress of the North Sea Group is of great interest in this connection.

The WG has, through this research programme, made an effort to pinpoint some of the processes that need investigation, and the understanding of which is crucial for a successful study of the pollution situation in the Baltic. It is obvious that some tasks need more preparatory work and all the tasks cannot be carried out in one specific year. However, the projects that can be dealt with immediately should not wait for the other ones, but be started as soon as possible. It is believed that a period of 1-2 years is sufficient for the greater part of this study, which could then be called the "International

Baltic Pollution Study Year" (IBPSY). It is suggested that this study should be carried out in the period 1975-76.

The WG decided to recommend to ICES and SCOR to publish the research programme (Recommendation 4).

9. Base-line Studies of Pollution in the Baltic

This point was delegated to the Action Planning Group which had been set up for formulating a detailed programme for the implementation of the most urgently needed investigations outlined in the Report discussed under Point 8. It was stressed that a primary task for it was now to organize a base-line survey of the Baltic pollution (toxic substances in fish and the marine environment). In doing this the Action Planning Group should make all possible use of the experience gained by the North Sea Group.

10. Collaboration with other Bodies

This has already been touched upon, and it is obvious that close collaboration with the Baltic Marine Biologists, the Conference of Baltic Oceanographers, the Group of Experts on the Water Balance of the Baltic under the IHD, and a number of Committees within the ICES is highly desirable.

Further connections can easily be arranged through ICES and SCOR, should such be deemed to be of benefit to the Baltic pollution studies.

Dr Griffiths hoped that IOC could contribute to a successful conduct of the studies.

The WG would be pleased to offer within its competence whatever collaboration the Baltic Marine Biologists would need. (Recommentation 5).

11. Further Actions by the WG

The report of the meeting of the Action Planning Group should be annexed to this Report.

The next meeting of the WG should be held after the next ICES Statutory Meeting and SCOR Executive Committee Meeting but before the final Meeting of the Conference on the Protection of the Baltic, i.e. preferably by the end of March 1974.

Mr Tambs-Lyche said that ICES would be prepared to host the next meeting of the WG.

12. Revised Terms of Reference for the WG

No discussions were held under this heading.

13. Adoption of Recommendations

Adopted Recommendations are given below:

Recommendation 1

The Working Group

noting with satisfaction the positive answers of a large number of institutes from all the Baltic countries to the Questionnaire regarding sampling and analytical capacities, distributed through ICES in May 1972;

having considered the severe problems of analytical methodology for pollutants, especially for heavy metals and organic compounds, in water, food organisms, and sediment;

being aware that an international programme for a base-line survey in the Baltic is ultimately dependent on the reliability and comparability of the analytical data;

being also aware that a large variety of sophisticated methods and modifications is used at present by the different institutes wishing to participate in an international programme;

recommends that all institutes involved should be visited by experts before December 1973 in order to get complete and detailed information about the analytical methods, the sampling techniques, sample preparation and preservation, and the standards used at present;

recommends further that a meeting of the working analysts from institutes concerned with Baltic pollution studies be convened before February 1974 to discuss the analytical problems and to agree on comparable and practicable methods for an international exercise.

Recommendation 2

The Working Group

noting with satisfaction the Recommendation II-7 of the 2nd Meeting of Experts on the Water Balance of the Baltic Sea, convened by the National Committees for the International Hydrological Decade (IHD) in the Baltic countries;

desiring to avoid double work and overlapping of tasks;

noting further that the National Committees of IHD in the Baltic countries give high priority to the work described in the recommendation mentioned;

decides to offer collaboration with the National Committees of the IHD and to support their efforts by the means available to the WG.

Recommendation 3

The Working Group recommends that a special meeting on circulation modelling of the Baltic be held either in connection with the next Conference of the Baltic Oceanographers or in connection with the Statutory Meeting of ICES in Copenhagen in the last week of September 1974, and that opportunity should be given for scientists engaged in modelling efforts in similar situations to participate.

Recommendation 4

The Working Group

recognizing that the report on the "Research Programme for investigation of the Baltic Sea as a natural resource in view of marine pollution problems", after agreed revision by the drafting group, will serve as a basis and guideline for further scientific studies in the area;

recommends that the report be published by ICES and SCOR.

Recommendation 5

The Working Group

being aware of the severe methodological problems connected with routine biological investigations in the Baltic;

stressing the urgency of finding generally agreed solutions to these problems;

being informed that 6 working groups of the Baltic Marine Biologists are at present considering them;

hoping that the work of these groups will lead to acceptance of agreed, standard methods before 1975;

decides to keep close contact with the Baltic Marine Biologists in order to make maximum use of their experience and expertise in the detailed planning of its future work.

14. Presentation of the Report of the WG

This Report should be circulated to the members of the WG, and comments, suggested additions or deletions should be sent to the ICES Secretariat within 8 days from its reception.

Additional comments to the Research Programme should be submitted to Dr Bolin or Professor Hempel without delay.

As already mentioned, it is recommended that the Research Programme be published by ICES and SCOR.

15. Other Business

Mr Tambs-Lyche and the Chairman expressed the gratitude of the WG to the hosts of this Session, the "Institut für Meereskunde an der Universität Kiel", for their hospitality and help in various matters. Thereafter the Meeting was closed by the Chairman.

Action Planning Group
(SCOR/ICES WG 42)

Report of Meeting on 30 June 1973

1. The Action Planning Group met on 30 June, with the following participants:

Denmark:	Mr Vagn Olsen
Federal Republic of Germany:	Professor K. Grasshoff Professor G. Hempel (part of the time)
Finland:	Dr A. Voipio
German Democratic Republic:	Dr H-J. Brosin
Poland:	Dr W. Slaczka Dr L. Zmudzinski
Sweden:	Dr H. Ackefors Dr A. Lindquist
USSR:	Professor A. Aitsam
ICES:	Mr H. Tambs-Lyche

Professor Grasshoff chaired the meeting, and Mr Lambs-Lyche acted as Rapporteur.

2. There was no specific Agenda, but the Group agreed to consider the following two main items:

   a) preparation for a base-line study of the level of toxic substances in fish and shellfish from the Baltic and in their environment;

   b) the tasks proposed by the "Askö Group" as referred to the Group from the Working Group meeting the two previous days.

3. Concerning the base-line study the Group noted that, as it had been outlined by the Working Group at the Lund meeting, it was very similar to the corresponding study in the North Sea, and that to a large extent one could draw upon the experience gathered during that study. This has been taken into consideration in the following paragraphs.

4. The Group first discussed the compounds which should be determined in the organisms to be sampled, and in view of the differences in capacity and capability of the participating laboratories, it was agreed, that only a limited number of obligatory substances should be analysed by all participating laboratories, and that a supplementary list be made of those substances which it is very desirable that laboratories analyse, when they have facilities for doing so. In setting up the list, the Group kept in mind the desirability that it should include as many as possible of the compounds analysed during the North Sea study, since the comparison between the two areas may be of considerable interest.

   It was also stressed that the data gathered would not only be of use for the specific purpose of the base-line study itself, but they may also be of broader significance (example Pb in air/sea interaction).

5. The following metals should be obligatory: Hg; Pb; Cd. Second priority should be given to: Zn and Cu, and it is desirable that also Cr and Co are analysed. It was considered necessary to distinguish between "total Hg" and organo-Hg compounds, with information on "total Hg" as obligatory.

6. The following organic compounds should be analysed: γBHC; Dieldrin; DDT (total and derivatives); PCB's. Each participating laboratory should analyse as many of these compounds as they have facilities for.

   Concerning hydrocarbons it was hoped that these could be split in aromatic, aliphatic and olifenic ones. Aromatic hydrocarbons are the best indicators of petrohydrocarbonic pollution, since the other groups include substances that may have been generated from natural products.

   Chlorinated aliphatic hydrocarbons should also be included.

7. When considering the organisms to be included in the base-line study, it was kept in mind that it should be so designed that it may form a basis for later monitoring, and also that it is desirable that, to the extent possible the same organisms as were used in the North Sea study should be included. Finally, it was also found desirable that benthic organisms, bottom fish and pelagic fish were included.

   Some participants thought it desirable that plankton organisms be included as well.

However, in view of the difficulties with comparable sampling, differences in composition of the samples, and in age determination of larger planktonic animals like Mesidothea, it was agreed that inclusion of plankton organisms should not at this stage be made obligatory.

The following organisms will be obligatory and should be sampled and analysed by all participating laboratories:

cod, herring, flounder and mussels.

The list of desirable organisms include:

sprat, plaice, Macoma baltica, Mesidothea entomon and Crangon crangon.

Of these, plaice and Crangon will be of interest for comparison with the North Sea study, and it was hoped that the laboratories in whose areas they occur would include them.

8. For mussels one should analyse a representative sample of a population, the size distribution must be determined. For the fishes it is desirable to include both O-group and older specimens (cp. paragraph 11). Fat content, sex, year class and size distribution must be determined. For herring, both fillets (obligatory) and whole fish (desirable) should be analysed.

It was recommended that laboratories which have facilities for it should analyse the contents of petroleum hydrocarbons in mussels, and that the laboratories concerned should exchange reference standards between them.

It was agreed that the coordinator of the base-line study would, as soon as possible, distribute to all participating laboratories detailed instructions for sampling and analytical procedures, based on the instructions used for the North Sea study.

9. Complete comparability between the results of analysis from all participating laboratories is essential for the success of the base-line study. Comparability includes sampling procedures, sample preparation and storage, calibration of the methods used and intercalibration between the laboratories. A review of the methods used in the different laboratories revealed a wide variety of procedures, and the Group found that the best way to ensure complete comparability would be that one, or preferably two, experts visit the participating laboratories. This would result in a collection of methods, which would be made available to everyone, and in an exchange of views as to the best procedure to select for the present study. In this connection it was, however, stressed that the aim is comparability and not standardization.

The Chairman informed the Group that he expected that the travel cost for two experts would be met by the assistance of the "Institut für Meereskunde" and SCOR.

When the report of the two experts is available, a meeting of the analysts concerned with the base-line study should be held as soon as possible in order to agree on the methods to be used.

A third step could be a workshop of 20-25 analysts for demonstration and comparison of methods. This could result in the compilation of a manual, which would be of very great importance for the monitoring which one expects will follow the base-line study.

10. The Group then discussed the timing of the base-line study and the preparations for it, and agreed that:-

- the visits to laboratories by the analytical experts should take place in the autumn of 1973, and preparations for them should start immediately;
- the meeting of analysts should be held early in 1974, in any case not later than February, and it could be held at the ICES headquarters;
- the workshop may be held in March 1974. Professor Grasshoff informed the Group that his laboratory would be prepared to host it.

11. In view of the urgency of the study, the necessary sampling should be done as early as possible.

Cod and herring should preferably be sampled in October-December. Sampling of O-group cod and herring is desirable, but not essential. For older herring, each sample must be of uniform age, and sex and size determined. For cod one should aim at sampling the 3 and 4 year olds, and sex, age and size distribution must be reported. Flounder should also be sampled in the last quarter of the year, each sample to be of uniform age, and age, sex and size distribution to be reported.

Plaice (when collected), as for flounder.

Sprat (when collected), as for herring.

Mussels should also preferably be collected at the end of the year, or a little earlier.

Based on these observations, the Group recommended that sampling for the base-line study should be undertaken in the last quarter of 1973. The samples should be stored (frozen), and the analytical work should preferably start immediately after the meeting of the analysts. If it is done earlier, part of the sample should be kept for later parallels, if needed.

12. The Group recommended that, in addition to each country sampling in its own coastal waters, the areas should be divided as follows:

Finland:	the Bay of Bothnia and the Åland Sea; some samples also from the Finnish Bay.
Sweden:	the Bothnian Sea and from Åland to Gotland/Øland; west of Gotland; in the Arkona Basin, and between Bornholm and Sweden.
Denmark:	the Danish Belts, the Sound and around Bornholm.
Federal Republic of Germany:	the Kiel Bight, west of Bornholm, and the Arkona Basin.
German Democratic Republic:	along its coasts.
Poland:	east of Bornholm, south of Gotland.
USSR:	the eastern part of the Gotland Basin, the Bay of Riga and the Finnish Bay.

Each participating country will as soon as possible report to the coordinator on the samples collected. It was stressed that while sampling must be made both in coastal areas and in the open Baltic, the sampling network in the coastal areas should be denser.

13. It was strongly recommended that the laboratories which will participate in the base-line study should join the international intercalibration organized under the auspices of the ICES Working Group on the Study of the Pollution of the North Sea, where provisions have already been made for participation by Baltic laboratories. The coordinator will contact Dr Portmann and Dr Topping about this and make the necessary arrangements.

14. The Group thereafter considered the possibility of including analysis of toxic substances in sea-water in the base-line study. It was agreed that while it is premature to include DDT's and PCB's, petroleum hydrocarbons should, if possible, be included. If so, however, the sampling should be made after the meeting of analysts and after the planned workshop. It is necessary that this sampling is done by research ships with trained personnel.

    Information available indicates that the values for the content of toxic metals in sea-water in the open Baltic are very low (with some exceptions). Methods are available for analysis of Cu, Pb, Zn and Cd, but sampling without the risk of contamination, and storage of samples cause difficulties. At present it seems that the only really safe method is to use bottles of quartz, which are very expensive, and to deep-freeze the samples.

    It was therefore agreed that this should not be included in the base-line study now. However, the question should be taken up again at a later date, after the planned workshop has been held. Reference was also made to Task 7 of the "Askö" Report (see para. 24 below).

15. The information available on the content of toxic substances in bottom sediments are very difficult or impossible to interpret at present, and some basic studies must be made before a meaningful base-line study of this can be designed. When more information is available, it may possibly be included in Task 7 of the "Askö" Report.

16. Finally, the Group unanimously requested Professor K. Grasshoff to take upon him the task of coordinator of the base-line study, and Professor Grasshoff agreed to this.

17. The Group then considered the tasks proposed by the "Askö Group", as modified during the Working Group's discussions the previous days.

18. Task 1: Exchange of matters and waters with the North Sea

    The Group was informed about the Danish programme for a considerable intensification of the studies of these problems during the next five years, and also that some tri-lateral cooperation between Denmark, Sweden and DDR is planned, in order that the area between Sweden and Bornholm and the entrance to the Arkona Basin will be included, in addition to the Sound and the Danish Belts.

    The Action Planning Group took note of this very satisfactory development and hoped that progress of these investigations will be reported to the ICES/SCOR Working Group, with a view to exchanging information and to a coordination with other studies under the auspices of that Group; and that the group of national coordinators, which it understood would be established, will keep as close contact as convenient with the ICES/SCOR Working Group.

The Action Planning Group stressed the importance of these investigations, which are essential for any deeper understanding of the pollution situation of the Baltic as a whole.

It finally drew attention to the desirability of using the Sagami standards for nutrients (cf. Council Resolution 1970/3:6(c)), since this would increase the comparability of the results of different related studies.

19. Task 2: The open sea experiment

It was noted that the Working Group had recommended that this experiment should be made at one station, and that the study of the breaking of internal waves should be transferred to Task 4. It was considered that an area northeast of Gotland would be most suitable for the experiment.

One medium-sized research vessel is needed for observation periods of 2 weeks each in April, August and November. This would mean a $3\frac{1}{2}$ week's cruise (total time) at each occasion.

It was understood that instrumentation for the vertical measurements needed would be available in 1975, and that the other instrumentation is available. If the experiment periods are covered by more than one vessel, it will be necessary to run at least one set of measurements simultaneously for proper intercalibration.

The Group was informed that Finland may be interested in participating with one vessel for one period; that Sweden is interested in the work but could make no commitment yet; that USSR is highly interested and expect to provide one ship, and that DDR and FRG are both interested and may have ships available. The chances that this experiment will be made by international cooperation are therefore very good, and the Group recommended that a task group should be established for detailed planning as soon as this report has been approved by ICES and SCOR.

The Group agreed, however, that somewhat more specific information about the substances to be measured is needed before detailed plans can be drawn up. These substances should include both dissolved and particulate matters (for instance silicate and total phosphate, and particulate organic carbon). In addition, optical measurements should be included.

The number of measurements will probably be limited by the size of the participating ships and the possibility for accommodating at least 12 scientists and technicians, since for the duration of the experiments measuring will continue around the clock, with very close time spacing.

20. Task 3: The Baltic circulation, development of an exploratory model, followed by field observations

Detailed planning of this task cannot be made before more concrete information is available from the oceanographers working on modelling of the Baltic. The Group was informed by Professor Aitsam that such information about a three-layer model may be available in the autumn of 1973.

The field observations must be quasi-synoptic, which probably means that there will be a need for 5-8 vessels during a period of about 10 days; in addition, one could make use of the Finnish coastal stations and the Swedish coast-guard stations. The autumn would probably be the most convenient time for a field test, but it would have to be before the thermocline breaks down in September.

An expert task group for planning should be established, when the task has been approved in principle by ICES and SCOR. The participants indicated that all the countries represented were interested in this task and hoped to be in a position to participate.

21. Task 4: The lateral boundary layer experiment

The Group was informed that this would be a Swedish-Polish programme, with some cooperation from USSR and DDR, and depending upon the availability of national finances. It was understood that some preliminary planning is already being undertaken, and it was hoped that the countries concerned would form a task group, which will keep contact with the ICES/SCOR Working Group, so that the experiment can be coordinated with other elements of the Baltic programme.

22. Task 5: Open sea multi-disciplinary continuous stations

The Group agreed that the possibility should be investigated of a combination with Task 2, so that one Task 5 station is combined with the Task 2 experiment, possibly in the spring of 1975, and the two other Task 5 stations are made in 1976. It was also the view of the Group that core samples would probably need to be taken at only one of the three stations.

FRG is very interested in this task, and a suitable vessel will almost certainly be available in 1975.

Poland will also investigate the possibility of using a ship for this purpose.

In this connection the Polish participants informed the Group about plans in their country for equipping an old and large cargo-ship as a semi-permanent marine station, which could be stationed for longer periods at one place, with possibilities for changing the scientific teams.

The Action Planning Group welcomed this news, and look forward to receiving more details about this very interesting plan.

None of the other participants could make commitments at this stage, but they would consider the possibilities and report at a later stage.

The Group recommended that detailed planning for this task should be undertaken by a task group of experts, when approval of it in principle had been made by ICES and SCOR. This planning should be done in close collaboration with an ongoing Swedish programme of periodical measurements of primary and secondary production, so overlapping is avoided and the two studies will be complementary.

The task group to be established would probably also need to make use of the results of the base-line study.

23. Task 6: Biological productivity studies at fixed stations

The Action Planning Group considered that this task is at present mainly one of coordination of ongoing studies. A detailed list of these studies is the first requirement. It is also strongly recommended that the countries concerned coordinate their efforts by establishing a joint task group for this purpose, and that progress of the studies be reported annually through the ICES/SCOR Working Group in order that experience and results may be exchanged and the results of studies be made available as soon as possible for the benefit of the other studies of the Baltic and possibly also for any later monitoring that may be agreed.

It may also be necessary for the ICES/SCOR Working Group to take an initiative in order that the network of observations will give satisfactory coverage of the Baltic as a whole.

The necessary standardization would probably best be achieved through the work of the Baltic Marine Biologists. The participants from the Lysekil Laboratory undertook to provide information on the studies going on at present.

24. Task 7: Determination of toxic substances throughout the food-chain

This task will be a follow-up of the base-line study. Detailed planning is therefore only possible when the preliminary results of that study are available.

From a feasibility viewpoint, however, the Action Planning Group agreed that it will be necessary to limit the number of substances to be followed through the food-chain to a few selected ones. Also for this reason is it necessary to await the first results of the base-line study before any action is taken.

ANNEX XIII

RECOMMENDATIONS BY SCOR WG 43
(based on GATE C-scale meeting, October 1973)

1. Emergency buoy operations

It is noted that there may be a need for emergency ship operations in the event of mooring failures. The fixed position C-scale ships are most likely to be involved. Such emergencies may entail interruption of the routine programme for short periods.

2. Buoy identification

The group recommends that all buoys, both moored and drifting, should be properly marked and identified. It further recommends that a list of buoy types and markings, with drawings, be circulated to all participating ships.

3. Positions of C-scale ships

It is recommended that the C-scale ship triangle remain close to the centre of the B-area. It is not desirable to move it to the northeast because of the anticipated decrease of the mixed layer thickness in this direction.

4. B-area measurements

The group reemphasized the need to have high resolution (10 km) measurements on four sets of tracks between Dakar and station positions as stated in the SCOR Proposal for a GATE Oceanographic Programme. Should there be the requirement for STD stations on selected positions along these tracks, these measurements could be carried out when allowing for additional ship time.

5. Data Management

(a) It is recommended that the two experts (Pollard, Sell), nominated in London in June 1973 to represent SCOR WG 43 in matters related to the oceanographic subprogramme data management (SPDC), contact the ISMG and BNDO soon for a discussion of SPDC data requirements.

(b) It is recommended that in cases where only compressed data are stored at the SPDC, provision be made for obtaining detailed data through the SPDC upon special request.

(c) The group noted Dr Miyake's report that the BNDO would welcome the setting up of a group of experts to advise on validation procedures at the oceanographic SPDC. The group welcomed this report, and recommended that such a group should include a representative from each of the scientific analysis institutions and a representative of the USSR.

(d) The group considered that April 1975 would be a reasonable deadline for completion of the C-scale oceanography data set by BNDO in a form suitable for transfer to the scientific analysis centres.

6. Aircraft

The group agreed that it is desirable

(1) To work closely with the boundary layer subprogramme in order to achieve flight plans that would simultaneously meet the needs of oceanographic and boundary layer programmes.

(2) To work with the ISMG aircraft planning group with a view to including a formal commitment to the oceanographic subprogramme.

7. SCOR WG 43 Contribution to GATE

(1) To prepare initial scientific programme.

(2) To advise ISMG on implementation of oceanographic subprogramme, especially to advise ISMG in every case where the originally required oceanographic data set may have to be changed due to logistic problems.

(3) To inform ISMG about plans for roving ships and achieve joint planning with ISMG for roving ships where necessary.

(4) To advise ISMG on data management and organize the scientific analysis phase and oceanographic symposia.

ANNEX XIV

JOINT OCEANOGRAPHIC ASSEMBLY

STEERING COMMITTEE

Report of meeting on 31 January 1974

The Steering Committee met in Canberra on 31 January 1974 under the chairmanship of Professor Wooster (SCOR/ACMRR); other members of the Steering Committee present were Mr Hemmen and Mr Currie (Royal Society), Professor Lacombe (IAPSO), and Dr Gaskell (CMG). Other participants included Sir George Deacon, Chairman of the British Organizing Committee; Professor Charnock, President of IUGG; Dr Humphrey, Chairman of IOC; Professor Postma, President of SCOR; Dr Giermann (IOC); Dr Steyaert (UNESCO) and representatives of National Committees of South Africa, Portugal, Italy, United Kingdom, Sweden and Australia (see Annex I).

On the basis of decisions reached at the previous meeting of the Steering Committee (see Proceedings, Vol. 9, Annex XI), the following were discussed:

Program: A draft program had been circulated by the Chairman in August 1973, and some comments and suggestions had been received. After some discussion, it was agreed to request the British Organizing Committee to review the draft program in the light of the discussion and to prepare an improved version for consideration by the Steering Committee. The proposals should include topics and possibly speakers for one or two evening public lectures. It was hoped that agreement on a final program could then be reached by correspondence, and that assignments of responsibility for organizing the various symposia could then be negotiated, also by correspondence.

Announcement: A draft announcement of the Assembly had been prepared by Mr Hemmen. After further review of this draft by the Chairman, it should be distributed to SCOR Members and Affiliated Organizations, National Committees, sponsoring agencies (UNESCO/IOC, FAO, WMO, UNEP), ICSU and its components (IUGS, IUBS, IUGG, SCAR, SCOPE, etc), and to certain publications, such as Science, Nature, Deep-Sea Research, E⊕S.

Publications: It was noted with appreciation that FAO was prepared to undertake compilation and publication of preprinted abstracts for both invited and contributed papers, on the condition that the editing of the abstracts should be arranged by the Steering Committee and that a realistic timing for submissions and processing is agreed upon. With regard to the full texts of papers, it was agreed to publish only the invited papers of the General Symposia, estimated as 24 in number. The British Organizing Committee, after exploring the interest of several publishers, should make the selections and the necessary arrangements for publication.

Logistics Committee: That Committee had met in Paris on 1 November 1973, under the chairmanship of Mr D. P. D. Scott, Secretary of IOC. The discussions were principally concerned with obtaining funds, to bring conveners and invited speakers who cannot obtain national funding, and with providing support for scientists from developing countries.

Other Matters: The British Organizing Committee was asked to organize an exhibition of oceanographic equipment by Scientific Laboratories, largely in the United Kingdom and northern Europe. Invitations will also be extended to visiting research vessels.

The next meeting of the Steering Committee will take place at the time of the 12th SCOR General Meeting.

ANNEX XV

SOME FUTURE MEETINGS OF SCOR AND ASSOCIATED ORGANIZATIONS

1974

4 - 9 February	Paris	IOC Tsunami Warning System 6th session
11 - 15 February	Paris	ICES/FAO/IOC Joint Coord. Gp. CINECA
12 - 16 February	Paris	ICES/FAO/ICES Coord. Gp. 3rd session
26 - 28 February	London	SCOR WG 43: GATE Oceanography
5 - 8 March	Geneva	WMO/IOC/SCOR/SCAR ad hoc meeting expendable buoy programmes
March - April	Singapore	UNESCO Adv. Pan. Mar. Biol. Centres
23 - 29 March	Geneva	IMCO/FAO/UNESCO/WMO/IAEA/UN: GESAMP
25 - 27 March	Leningrad	SCOR WG 43: GATE Oceanography
1 - 5 April	Madison	W'shop Math. & Stat. models quantific. paleo-ocean. data
1 - 6 April	Paris	IOC - Ed. Bd. ICITA Atlas Vol. II
15 - 19 April	Paris	IOC-Gp. Exp. Ocean Res. IGOSS (IRES)
22 - 24 April	Paris	IOC - Ed. Bd. IIOE geol. /geoph. atlas
?	Buenos Aires	UNESCO Symp. Biol. of Benthos of E. S. American Cont. Shelf
25 - 27 April	Paris	IOC/IHO GEBCO Guiding Cttee.
April	Leningrad	SCOR WG 43: GATE Oceanography

6 - 11 May	Montreal	SCOR/SCAR Polar Oceans Conference
13 May	Montreal	SCAR Subcom, Antarctic Mar. Biol. Resources
13 - 17 May	Rockville, Maryland	IOC-Polln. Workshop & Symp.
15 - 17 May	Kiel	ICES/SCOR WG 42: Baltic Pollution
20 - 22 May	Paris	IOC ad hoc gp POOL
24 - 27 June	Paris	SCOR WG 46: River inputs to oceans
17 - 22 June	Ottawa	IOC-EC 4th session
20 June - 29 August	Caracas	UN Conference on The Law of the Sea 2nd session
24 - 28 June	Kiel	SCOR/ACMRR/ACOMR WG 36: Coastal Upwelling Processes, Phys. & Biol. Panels
26 - 30 June	Guadeloupe	IOC - Caribbean Geol. Workshop
15 - 20 July	Buenos Aires	IOC-ICG Southern Oceans 2nd session
15 - 19 July	New York	IOC-ICG-GIPME 2nd session
25 - 31 August	Washington	SCAR/IUBS Antarctic Biol. Symp.
September	Brest	SCOR WG 27: Tides of the Open Sea
9 - 13 September	Kiel	SCOR WG 37: Marine Plankton and Sediments Symposium and WG mtg.
		?SCOR WG 40: Paleo-oceanography
9 - 27 September		ICES Int. W'shop. Methods analysis of potential pollutants in sea, organisms and sediments
12 - 22 September	Istanbul/Ankara	ICSU-GA
26 - 27 September	Copenhagen	ICES/SCOR spec. mtg. on models of water circ. in Baltic
30 September - 9 October	Copenhagen	ICES 62nd Statutory meeting
9 - 14 September	Monaco	IOC - Med. Polln. Workshop
1 - 4 October	Bordeaux	OCEAN/EXPO Exploitation of the Oceans

21 - 26 October	Geneva	IOC/WMO Jt. Gp. Exp. IGOSS Tech. Syst. design (ITECH) 2nd session
December	Equador	IOC - El Niño Workshop
December	Equador	SCOR XII General Meeting
6 - 14 December	Monaco	CIESM XXIV Congress
		ICES Liaison panel Mar. Res. related to pollution
9 - 13 December	Paris	IOC/WMO IGOSS Telecoms. (ITEL) 5th session
Other possible meetings	1974	
		SCOR/ACOMR/IAMAP WG 44: Tropospheric Transport of Pollutants
		SCOR/ACMRR/ACOMR/ECOR/GESAMP/ ICES Liaison panel Mar. Poll. Res.
	Oslo	SCOR Edit. group Phytoplankton Methods H'book (from WG 33)
End 1974	Monaco	IOC-ICG Coop. Inv. Medit. (CIM) 2nd session

1975

March	Palma (Mallorca)	CIM/CMG Mediterranean Marine Geology Symp.
March / April	?	SCOR WG 43: GATE Oceanography
May	?	SCOR Executive Committee
25 August - 5 September	Grenoble, France	IUGG General Assembly IAPSO General Assembly SCOR/ICES/UNESCO WG 10: Oceanographic Tables and Standards SCOR WG 43: GATE Oceanography
29 September - 8 October	Montreal	ICES 63rd Statutory Meeting

1976

January	?	SCOR Executive Committee
16 - 25 August	Sydney	Int. Geological Congress CMG Meeting
13 - 24 September	Edinburgh	SCOR/IAPSO/IABO/CMG Joint Oceanographic Assembly - "Ocean World II" SCOR XIII General Meeting

ABBREVIATIONS

ACMRR	Advisory Committee on Marine Resources Research (of FAO)
ACOMR	Advisory Committee on Oceanic Meteorological Research (of WMO)
AMTEX	Air Mass Transformation Experiment (GARP)
AOML	Atlantic Oceanographic and Meteorological Laboratory (NOAA Miami)
ASFIS	Aquatic Science and Fisheries Information System (FAO/IOC)
BNDO	Bureau National de Données Océaniques (France)
CCOP/EA	Committee for Coordination of Joint Prospecting for Mineral Resources in offshore areas/East Asia
CCOP/SOPAC	Committee for Coordination of Joint Prospecting for Mineral Resources in offshore areas/South Pacific
CICAR	Cooperative Investigation of the Caribbean and Adjacent Regions
CIESM	Commission International Exploration Scientifique Mediterranean
CIM	Cooperative Investigation of the Mediterranean
CINECA	Cooperative Investigation of the Northern Part of the Eastern Central Atlantic
CLIMAP	Climate: Long Range Investigation Mapping and Predictions (IDOE programme)
CMG	Commission on Marine Geology (of IUGS)
CNRS	Centre National de la Recherche Scientifique
COB	Centre Oceanological de Bretagne (CNEXO)
COSTED	Committee on Science and Technology in Developing Countries (of ICSU)
ECAFE	Economic Commission for Asia and the Far East (of UN Economic and Social Council)
ECOR	Engineering Committee on Oceanic Resources
ECOSOC	Economic and Social Council of UN
ESRO	European Space Research Organization
FGGE	First GARP Global Experiment
GARP	Global Atmospheric Research Programme (of WMO/ICSU)
GATE	GARP Atlantic Tropical Experiment
GEBCO	General Bathymetric Chart of the Ocean
GESAMP	Group of Experts on Scientific Aspects of Marine Pollution (UN UNESCO WMO FAO IMCO WHO IAEA)
GIPME	Global Investigation of Pollution in the Marine Environment
IABO	International Association for Biological Oceanography (of IUBS)
IAG	International Association of Geodesy (of IUGG)
IAMAP	International Association of Meteorology and Atmospheric Physics (of IUGG)
IAPSO	International Association for the Physical Sciences of the Ocean (of IUGG)
IAHS	International Association of Hydrological Science (of IUGG)
IBP/PM	International Biological Programme/Productivity Marine
IBPSY	International Baltic Pollution Study Year
ICES	International Council for the Exploration of the Sea
ICG	Inter-Union Commission on Geodynamics (of IUGG/IUGS) and also used with reference to International Coordination Groups of IOC
ICSPRO	Inter-Secretariat Committee on Scientific Programmes relating to Oceanography (UN UNESCO WMO FAO IMCO IOC)
ICSU	International Council of Scientific Unions

IDOE	International Decade of Ocean Exploration
IGOSS	Integrated Global Ocean Station System (of IOC)
IHB	International Hydrographic Bureau
IHD	International Hydrological Decade
IHO	International Hydrographic Organization
INDEX	Indian Ocean Experiment
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data Exchange (Working Group of IOC)
IOS-B	Institute of Oceanographic Sciences - Bidston (UK)
IOS-W	Institute of Oceanographic Sciences - Wormley (UK)
ISMG	International Scientific and Management Group for GATE
ISOS	International Southern Ocean Studies
ITEX	Internal Tide Experiment
IUBS	International Union of Biological Sciences (of ICSU)
IUGG	International Union of Geodesy and Geophysics (of ICSU)
IUGS	International Union of Geological Sciences (of ICSU)
IUPAB	International Union of Pure and Applied Biophysics
JASIN	Joint Air-Sea Interaction Project
JOA	Joint Oceanographic Assembly (1976)
JOC	Joint Organizing Committee for GARP
JPS	Joint Planning Staff for GARP
LEPOR	Long-Term and Expanded Programme of Oceanic Research
MODE	Mid-Ocean Dynamics Experiment
NASA	National Aeronautics and Space Administration (USA)
NOAA	National Oceanographic and Atmospheric Science Administration (USA)
NORPAX	North Pacific Experiment
POLEX	Polar Experiment (related to GARP)
POOL	Pollution of Oceans Originating on Land
ROMBI	Results of Marine Biological Investigations (report form)
ROSCOP	Report of Observations or Samples Collected by Oceanographic Programmes
SCAR	Scientific Committee on Antarctic Research (of ICSU)
SCIBP	Special Committee for International Biological Programme (of ICSU)
SCOPE	Scientific Committee on Problems of the Environment (of ICSU)
SHOM	Service Hydrographique et Oceanographique de la Marine (France)
SIO	Scripps Institution of Oceanography (USA)
SPDC	Subprogramme Data Centre, GATE Oceanography
TEB	GARP Tropical Experiment Board
TEMA	Training, Education and Mutual Assistance (IOC-WG)
UCSD	University of California, San Diego
UNEP	UN Environment Programme
WDC	World Data Centre