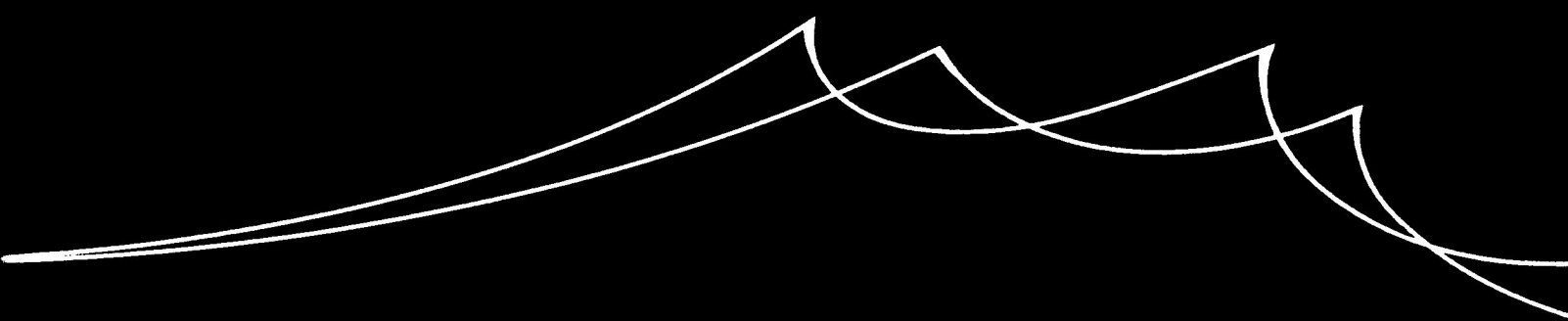


SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH



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INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

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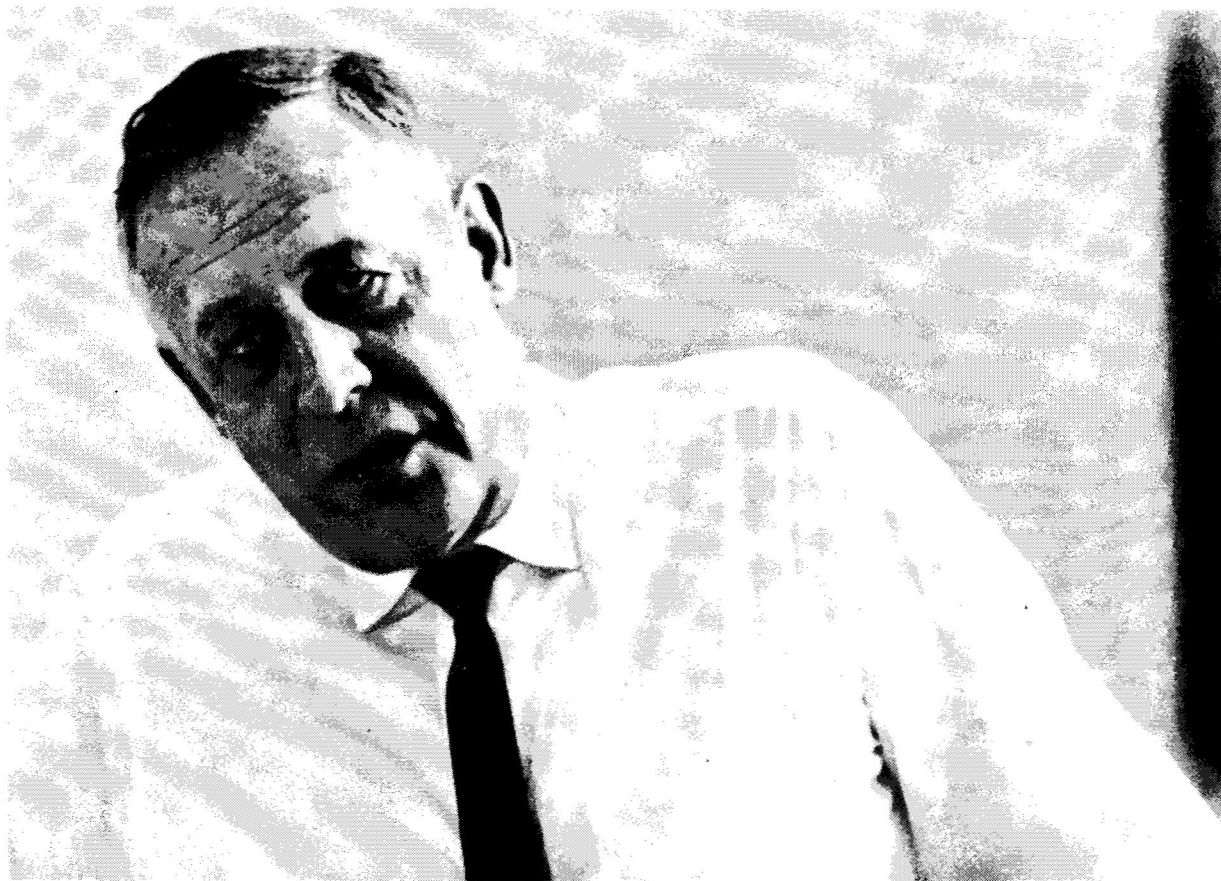
**PROCEEDINGS
OF THE
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH**

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TABLE OF CONTENTS

Contents	Page
List of SCOR Members and Executive Committee	Inside Front Cover
Proceedings	35
Annex I List of participants, Executive Meeting, Göteborg, 26-28 August 1969; Joint Meeting with officers of ACMRR, Paris, 29 August 1969	44
Annex II Estimate of SCOR Finances (through 30 September 1969)	45
Annex III Report of Working Group 21 on Continuous Current Velocity Measurement: Meeting in Dublin, 25-27 September 1969	45
Annex IV Extracts from report of Working Group 28 on Air-Sea Interaction: Meeting in Princeton, 21-23 January 1969	48
Annex V Terms of reference and membership of Working Groups 29, 32 and 33	52
Annex VI Oceanographic research required for development of IGOSS	53
Annex VII Comments on development of the Expanded Program: Statement submitted by SCOR and ACMRR to VI Ses- sion of Intergovernmental Oceanographic Commission	54
Annex VIII Analysis of IOC VI Session resolutions	55
Annex IX Meetings of SCOR and associated organizations in 1970	59
List of Abbreviations Used	Inside Back Cover



This issue of Proceedings is dedicated to Roger Revelle in the year of his sixtieth birthday. Professor Revelle was the first President of SCOR and continues to play an important role in its activities. He has been the source of inspiration and the vigorous and able proponent for international cooperation in the scientific exploration of the oceans, as well as the originator of many international activities intended for that purpose. The following lines from a recent book pay tribute to his influence:

"I first heard of oceanography nearly ten years ago from Roger Revelle... At a sleepy meeting in Paris, a big slouching man rose to his feet and began to speak of geology at sea. His voice and presence filled the committee room. He told of oily uncomfortable ships, of the great grinding mills that destroy the sea floor in the deep trenches, of the maps of this realm that were no better than the land maps of the seventeenth century.

"More than any other single figure, Revelle is responsible for the introduction of oceanography into public affairs. He began as a marine geologist and geophysicist; he has evolved into a statesman of science."

Daniel Behrman "The New World of the Oceans"
Little, Brown and Company, Boston, 1969

PROCEEDINGS
of the
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

Report of the 13th Executive Committee Meeting
Göteborg and Paris, 26-29 August 1969

The meeting of the SCOR Executive Committee was held at the Oceanographic Institute, Göteborg, Sweden, on 26-28 August 1969, with the President, Professor Wooster, in the chair. Local arrangements were made by Professor Kullenberg, Member of SCOR and Director of the Oceanographic Institute (University of Göteborg). Various aspects of marine science in Sweden were presented by Professors Kullenberg and Welander of the Institute, and by Drs. Dybern and Fonselius of the Fishery Board of Sweden.

On 29 August, the SCOR Executive Committee met jointly with officers of the Advisory Committee on Marine Resources Research (of FAO) in UNESCO House, Paris, with Professor Wooster in the chair. The results of this meeting are recorded under the appropriate items below.

A list of those who attended both meetings is given in Annex I. The agenda of the Göteborg meeting serves as an outline for the report which follows:

1.0 ORGANIZATION AND FINANCE

1.1 MEMBERSHIP

Since the last Executive Meeting, the following changes have occurred:

Dr. Gaskell has become Chairman of the Commission on Marine Geology and thus has replaced Professor Heezen as ex officio member of the Executive Committee; Professor Heezen remains as an IUGS nominee to SCOR.

Professor Miyake has replaced Professor Hayami from Japan, and Professor Morton has replaced Dr. Humphrey from Australia.

New members are Professor Brekhovskikh (ICSU), Dr. Hassan (UAR) and Professor Vaissiere (Monaco).

The desirability of making a concerted effort to increase membership further was discussed. It was agreed that the initiative should come from scientists rather than from governments and that members from additional countries with active programs in marine science would be welcomed. Assistance might be sought from the ICSU Secretariat in approaching national scientific bodies in selected countries. Preparation of the proposed brochure on the history, purpose, function and accomplishments of SCOR was considered desirable, and Captain Capurro agreed to prepare a brief history of the Committee for incorporation in such a brochure.

1.2 BUDGET AND FINANCE

An estimate of SCOR finances through 30 September 1969 is given in Annex II. An effort will

be made to utilize the rupee balance to facilitate participation of Indian scientists in the Joint Oceanographic Assembly in 1970 (see item 6.2).

The proposed broadening of SCOR responsibilities (see item 4.1) will entail a significant increase in expenses. Additional funds will be required for the organization of symposia of the Joint Oceanographic Assembly. Implementation of a long term and expanded program of ocean research by the Intergovernmental Oceanographic Commission will also occasion increased activity and expenditure by SCOR, if scientists are to play an appropriate role in the planning of that program.

It seems likely that additional support will be available from UNESCO during the 1971-72 fiscal period. In addition, it will be necessary to ask for larger national contributions. The President was requested to discuss the matter in correspondence with National Committees and with the ICSU Secretariat and to present specific recommendations to the 14th Executive Meeting in March 1970.

1.3 PUBLICATIONS

The report of the 12th Executive Meeting (Mexico City, 29-31 January 1969) was published in Proceedings, vol. 5, no. 1, which was distributed in April. The report of WG 30 on Scientific Aspects of International Ocean Research (Ponza and Rome, 29 April to 7 May 1969) was issued as a special publication entitled "Global Ocean Research" in early June. Both reports were distributed to SCOR Members and National Committees and to all members of SCOR working groups. An additional 1500 copies of the Ponza report were printed for use by UNESCO, FAO and WMO who also had the report translated into French, Spanish and Russian.

Papers presented at the SCOR Symposium on Variability in the Ocean (Rome, 23-27 May 1966) were published as vol. 5 of Progress in Oceanography by Pergamon Press in the summer of 1969. The volume was edited by Professors Braarud and Stewart. Financial assistance was provided by the Consiglio Nazionale della Recherche in Italy; the assistance of Professor Aliverti in making these arrangements is gratefully acknowledged.

Reports of SCOR working groups are normally published in the Proceedings or in the UNESCO series Technical Papers in Marine Science. Although the latter series is given broad distribution to libraries, existence of specific reports may not be known to individual scientists. Therefore, it was proposed in the case of reports of particular significance or broad interest that the chairman of the group be requested to prepare an abstract which could then be published, together with a statement on where copies can be obtained, in a few scientific journals which are widely read. The following journals and languages were suggested as most appropriate:

Deep Sea Research (English), Journal du Conseil (French), Okeanologiya (Russian).

2.0 WORKING GROUPS

2.1 ACTIVITIES RELATED TO PREVIOUS WORKING GROUPS

WG 25. Nutrient Chemistry: In preparation for the nutrient intercalibration experiment to be organized by the ICES Working Group on Chemical Analysis of Sea Water, Professor Sugawara has prepared a detailed description of the standard samples to be used in the experiment. This has been published as the CSK report "On the preparation of CSK standards for marine nutrient analysis". Cost of publication was met by SCOR and the Ministry of Education, Japan. A circular letter was sent to SCOR National Committees requesting them to identify laboratories willing to participate in the experiment. Steps toward implementing the experiment were discussed at

the 57th Statutory Meeting of ICES in Dublin during the week of 29 September 1969.

2.2 REPORT ON EXISTING GROUPS

WG 10. Oceanographic Tables and Standards (with ICES, IAPSO and UNESCO): An ad hoc group met at Nova University, Florida (27-28 February 1969) to discuss the discrepancies among various recent measurements of oxygen solubility in sea water as a function of temperature and salinity. Professor Carritt, chairman of the group, has reported that most of the differences resulted from curve fitting procedures, and that agreement was reached on procedures whereby a single set of interpolated values can be accepted.

WG 10 has not met since October 1967, and it will probably be necessary for another meeting to be held in late 1969 or in 1970. Work on the determination of absolute density and conductivity was reported to be well along at the National Institute of Oceanography (UK).

WG 15. Photosynthetic Radiant Energy (with IAPSO and UNESCO): Dr. Ian Baird (UK) has been nominated to the group by UNESCO to replace Dr. Steele. Under a contract with UNESCO, Mr. Tyler, chairman of the group, has completed a report on the May 1968 sea trials. This will be published by UNESCO as a Technical Paper in Marine Science, No. 13; an abstract should be prepared and published as discussed under item 1.3 above.

The group is scheduled to meet in Miami, 17-21 November 1969, to organize the program to be conducted on R/V DISCOVERER during the period 30 March - 2 May 1970. Ship operating expenses are being provided by the U.S. Environmental Science Services Administration (ESSA). The cost of transporting participants and their equipment to and from the ship has been estimated as \$5000 which in principle should be provided by the three sponsoring bodies. It was suggested that IAPSO should request funds from IUGG and that SCOR should seek support from appropriate national committees.

WG 21. Continuous Current Velocity Measurements (with IAPSO and UNESCO): The group met at the National Institute of Oceanography (UK) on 19-20 May 1969 and again in Dublin during the ICES Symposium on Physical Variability in the North Atlantic, 25-27 September 1969. The intercomparison experiment of July 1967 has been described in a report entitled "An intercomparison of some current meters", published by UNESCO (Technical Papers in Marine Science, No. 11) with the assistance of SCOR. An abstract of this report should be published as discussed under item 1.3 above.

It was agreed to congratulate the working group on the successful completion of this important experiment and the resulting report. National Committees should be encouraged to arrange further comparisons, paying particular attention to the design of the experiment, as discussed in the WG 21 report. The group, having completed its task under its present terms of reference, should consider what further action is required. For example, is it now possible to make general recommendations on the measurement of current velocity from moored stations?

Of particular importance is the comparison of Soviet current meters, such as the Alekseev meter, with those used in the 1967 experiment. Discussions in Dublin revealed the possibility of incorporating such an intercomparison in the program of R/V AKADEMIC KURCHATOV during the first quarter of 1970. The working group is now engaged in planning for this work (see report of Dublin discussions in Annex III).

WG 23. Zooplankton Laboratory Methods (with UNESCO): Experimental work proposed by this group is being conducted under the supervision of Dr. Steedman who has received a contract from UNESCO for preparation of a handbook on methods of zooplankton preservation. Support is also being provided by the National Environmental Research Council (UK), The Royal Society, and the Smithsonian Institution.

WG 24. Estimation of Primary Production under Special Conditions (with IBP/PM): Some of the work outlined in the first report of this group (Proceedings, vol. 5, no. 1, Annex IV) has proceeded more slowly than anticipated, and it is proposed to delay the second meeting until late 1970.

WG 27. Deep Sea Tides (with IAPSO and UNESCO): As a result of Dr. Cartwright's visit to La Jolla in March, the following paper has been prepared and published:

Cartwright, D., W. Munk and B. Zetler (1969). Pelagic tidal measurements. *EOS*, 50 (7) : 472 - 477.

WG 28. Air-Sea Interaction (with IAMAP and IAPSO): The third meeting of this group was held in Princeton, 21-23 January 1969. Extracts from the report are given in Annex IV. A further meeting is proposed for September 1970, in connection with the Joint Oceanographic Assembly in Japan.

WG 29. Continuous Monitoring in Biological Oceanography (with ACMRR, UNESCO and IBP/PM): Terms of reference and membership of this group are given in Annex V. Work has been initiated through correspondence, and a meeting is anticipated in 1970.

WG 30. Scientific Aspects of International Ocean Research (with ACMRR and WMO): This group met in Ponza and Rome, 29 April - 7 May 1969. The report "Global Ocean Research" was published in English in June, and in French, Spanish and Russian shortly thereafter. It was the basis of discussions by the IOC Working Group on the Long Term and Expanded Program of Oceanic Research, which met in Paris on 16-21 June 1969, and by the IOC at its VI Session in Paris, 1-13 September 1969. The IOC agreed to transmit "Global Ocean Research" as an attachment to its report to the UN Secretary General.

The Executive Committee recognized the important contribution made by the group and agreed that its members should be kept informed of subsequent IOC actions. At the 14th Executive meeting, a decision should be made on whether to continue the group.

WG 31. East Atlantic Continental Margin (with UNESCO and IUGS): The Symposium on Geology of the East Atlantic Continental Margin will be held at Churchill College, Cambridge, 23-27 March 1970. The program consists of a number of invited general and regional lectures in addition to lectures on economic aspects and contributed papers. Financial support is being provided by UNESCO, IUGS, SCOR, British Petroleum and Shell International Petroleum. Dr. D.H. Matthews is in charge of local arrangements. It is planned to publish the majority of papers.

WG 32. Biological Data Inventories (with ACMRR): Establishment of this group was approved at the 12th Executive Meeting in Mexico City. Professor Hempel has accepted the chairmanship, and the group is now being organized.

Terms of reference and membership of this group are given in Annex V.

WG 33. Phytoplankton Methods (with IBP/PM): Terms of reference and membership of this group are given in Annex V. Professor Banse has accepted the chairmanship. Work has been initiated through correspondence, and a meeting is anticipated in 1970.

2.3 CONSIDERATION OF NEW WORKING GROUPS

Atmospheric Dust: A proposal was received from the U.S. National Committee concerning establishment of a working group on worldwide monitoring of dust transported to the ocean by the atmosphere. The Executive Committee was sympathetic to this proposal which was closely related to the more comprehensive monitoring proposals in the Ponza report. However, it was noted

that a number of other international groups appear to be dealing with some aspects of this problem. For example, the WMO Executive Committee has established a Panel on Meteorological Aspects of Air Pollution which, among other things, is to recommend necessary action on monitoring background pollution of the atmosphere. ICSU has established an Ad Hoc Committee on Problems of the Human Environment that will deal with broader problems of pollution. The Executive Committee felt that consultation with these and possibly other pertinent groups, although necessary, would be time-consuming and would unduly delay the meeting proposed by Professor Goldberg for early 1970. Therefore it was agreed to encourage the U.S. and U.K. National Committees to arrange a first meeting on a bilateral basis. The results, together with the consultations referred to above, should permit SCOR to determine the most effective action it should take.

WG 34. Oceanographic Basis of Ocean Monitoring and Prediction Systems: A brief statement, prepared by the President, on the need for oceanographic research in the development of the IOC Integrated Global Ocean Station System (IGOSS) was circulated to a number of interested persons prior to the Executive Meeting and was distributed as an information paper at the IOC VI Session (see Annex VI). After a discussion of this matter, the Executive Committee decided to establish a new working group with the following terms of reference:

To identify the scientific problems related to the design and use of systems for the monitoring and prediction of oceanic conditions, including problems of sampling, general circulation and the development of predictive models, and to indicate relevant investigations in progress or being planned.

It was noted that at its V Session (October 1967), IOC had decided (Resolution V-20 D) to establish an IOC Group of Experts in the Field of Ocean Variability, with the term of reference the early development of a scientific program for monitoring, measuring and understanding ocean variability, that will become part of IGOS. Membership of this group was established at the 8th IOC Bureau Meeting (June 1968), but no meeting was scheduled until 29-30 September 1969. If the IOC group interprets its term of reference very broadly, there could be an overlap with the new working group. On the other hand, the problems are so complex that the concerted efforts of both groups will probably be required. In view of this situation, it was agreed to await the outcome of the first meeting of the IOC group before proceeding with organization of the new SCOR working group.

3.0 RELATION WITH UNITED NATIONS ORGANIZATIONS

3.1 ADVISORY MATTERS CONCERNING UNESCO

International Directory of Marine Scientists: Dr. Giermann reported that FAO had accepted the responsibility of completing preparation of the Directory, with assistance from UNESCO. Information will be processed by computer, thus facilitating indexing and eventual updating.

Research on the Deep Ocean Floor: UNESCO has accepted the proposal of the 12th Executive Meeting to publish collected reprints of selected papers resulting from scientific investigations of the deep ocean floor and its potential resources. The Executive Committee expressed its willingness, in cooperation with IAPSO and CMG, to assist in the collection and selection of the papers.

Advisory Committee for International Plankton Centers: The UNESCO secretariat had suggested that the Consultative Committee for the Indian Ocean Biological Center be revised to have broader responsibilities related to additional international centers such as those in Singapore and Mexico. The Executive Committee endorsed this proposal and requested Professor Hempel to prepare draft terms of reference for a broadened committee. Subsequently, the IOC endorsed the establishment of such an advisory committee.

3.2 ADVISORY MATTERS CONCERNING IOC

Long Term and Expanded Program of Oceanic Research: One of the principal matters before IOC at its VI Session would be the development of plans for the long term and expanded program of oceanic research. Through participation in the Ponza group (WG 30) and the subsequent meeting of the IOC Working Group, SCOR had already taken part in this planning. Although the Executive Committee did not feel that with respect to substance the Draft Comprehensive Outline prepared by the IOC group was an improvement on the Ponza report, it did not seem likely that extended attempts at the VI Session to improve further that outline would be fruitful. This point of view was discussed at the joint meeting with ACMRR, and it was agreed to submit a joint statement on the matter to the IOC Session (see Annex VII; subsequent IOC actions are discussed in Annex VIII).

Guide for Cooperative Investigations: The Guide had been prepared by the Chairman and Secretary of IOC and reflects IOC experience in the organization and conducting of such investigations. During the joint discussions with ACMRR, it was agreed that the draft contained many useful ideas, but that it was too soon to adopt it as the definitive statement of procedures to be followed. There have been numerous cooperative investigations during recent decades, on various scales and organized in different ways, and it would be desirable to make a careful study of such past experience. Further experiments in the tactics and strategy of cooperative oceanic research are required, and each such investigation will have some unique characteristics.

IGOSS: As noted under item 2.3, there is some opinion that increased attention should be given to the scientific research required before the design and use of a system such as IGOS is practicable. There is a need not only to identify the pertinent scientific problems, but also to stimulate interest among scientists in the broad question of monitoring and predicting ocean conditions. Accordingly, a new SCOR working group was proposed and will be activated when it is more evident what role will be played by the IOC Group of Experts in the Field of Ocean Variability.

Other Matters: Since the 12th Executive Meeting, SCOR has sent representatives to the following meetings dealing with problems of direct interest to IOC:

International Group for Scientific Coordination of the Cooperative Investigations in the Mediterranean - Professors Stommel and Vaissiere.

IOBC Consultative Committee - Dr. Humphrey.

Group of Experts on Scientific Aspects of Marine Pollution - Professor Postma.

IOC Working Group on the Long Term and Expanded Program - Professor Wooster.

IOC 9th and 10th Bureau, VI Session - Professor Wooster and Dr. Voigt.

IOC Group of Experts on Ocean Variability - Dr. Voigt.

3.3 RELATION WITH FAO/ACMRR

Since both SCOR and ACMRR have advisory responsibilities to IOC, a joint meeting of the SCOR Executive Committee and the officers of ACMRR was held on 29 August, just before the IOC VI Session. A joint statement to IOC on the development of the Expanded Program (see item 3.2 and Annex VII) was prepared, and agreement was reached on a number of other matters referred to elsewhere in this report. It was agreed that such joint meetings were very useful and should be arranged again in the future. It would be desirable, for example, for ACMRR or its officers to meet in Tokyo on the occasion of the Joint Oceanographic Assembly in 1970.

Transplantation of Marine Fauna: Review papers on this subject are being prepared by several specialists under contract to FAO. When these reviews are available, the proposal of the USSR National Committee for establishing a group of experts on the subject will be further considered.

Eastern Central Atlantic: The proposal for an international cooperative investigation of the eastern central Atlantic (Gibraltar to Dakar) was circulated to SCOR Members and National Committees for comment. Answers received before the Executive Meeting showed a widespread interest in the scientific problems of the region but gave no clear picture of how to proceed. Several proposals of WG 30, in "Global Ocean Research", also pertained to this region.

The FAO Secretariat had prepared a background paper for consideration by the IOC VI Session. The Executive Committee noted the need for better information on the meteorology of the region and for realistic oceanographic studies to accompany the fishery investigations being considered. It was also noted that geological and geophysical knowledge of the region would be assessed by WG 31. In discussions with the officers of ACMRR, it was agreed that there must be further informal discussions among interested scientists. The time was premature for establishment of formal intergovernmental coordination machinery. It was decided to await action by the IOC VI Session before deciding how the advisory bodies could most effectively assist in this program (see Annex VIII for discussion of IOC resolutions).

4.0 RELATION WITH ICSU AND CONSTITUENT BODIES

4.1 IMPROVED ICSU ARRANGEMENTS FOR MARINE SCIENCE

As a result of the IAPSO proposal for consideration of the desirability of an International Union of Marine Sciences, and a subsequent recommendation of the SCOR Executive Committee at its 12th Meeting, a background paper setting forth the advantages and disadvantages of such an organization was prepared by the President and distributed (in July 1969) to members and national committees. This paper also discussed an alternative arrangement whereby organizations such as IAPSO, IABO and CMG would retain their connections with their parent Unions but would also be linked together through the coordination of SCOR.

Nearly all responses to this paper agreed that improved arrangements were required and that the alternative of a broadened SCOR was the more practicable proposal. Discussions during the Executive Meeting confirmed this preference. Although experience in close cooperation between SCOR and the other bodies was already being gained, particularly in organizing the Joint Oceanographic Assembly, it would eventually be necessary to separate more clearly the functions of the organizations concerned and to make appropriate statutory changes. As noted earlier (item 1.2 above), additional funds would also be required. It was suggested that the Associations explore the reactions of their parent Unions to the proposed arrangement, and that the SCOR President correspond further with appropriate ICSU officials and with national committees, in preparation for continued discussion at the 14th Executive Meeting.

4.2 SYMPOSIUM ON INDIAN OCEAN BIOLOGY AND THE IIOE

During August-September 1969, Dr. Humphrey visited a number of scientists and institutions interested in this symposium and also conducted further discussions with Professor Krey, the IBP/PM nominee to the organizing committee. The symposium is to be held in March or April 1971 at the Institut für Meereskunde, Kiel (FRG). The sponsoring bodies (SCOR and IBP/PM) will not be able to supply all funds required for invited speakers and other participants, and it is hoped that other international organizations and appropriate national bodies will be able to provide the necessary support.

4.3 OTHER MATTERS

As agreed during the 12th Executive Meeting, financial support was provided to the Upper Mantle Committee Symposium on Inland and Marginal Seas (Madrid, 4-6 September 1969) and to the Royal Society Symposium on Petrology of Igneous and Metamorphic Rocks of the Ocean Floor (London, 12-14 November 1969).

5.0 RELATION WITH OTHER INTERNATIONAL ORGANIZATIONS

Financial support was provided to the ICES Symposium on Physical Variability in the North Atlantic (Dublin, 25-27 September 1969). Discussions with ICES are continuing on the organization of the nutrient intercalibration experiment (item 2.1).

6.0 FUTURE MEETINGS

6.1 SCHEDULE OF FUTURE MEETINGS

In recent years, because of the advisory relation with IOC, SCOR or its Executive Committee has usually met at about the same time as the IOC or its Bureau. The interval between meetings has been six to eight months. Such a schedule has permitted SCOR to react quickly to opportunities and problems that have arisen. However, some Members and National Committees have complained that SCOR meetings are too frequent. It is hoped that IOC will go on a schedule of eight-monthly meetings, with its Sessions at two-year intervals, and with two intermediate Bureau Meetings. Whether or not IOC adopts such a schedule, SCOR should do so after the 10th General Meeting in Tokyo.

An invitation has been received from the Royal Society to convene the 14th Executive Meeting in London in March 1970. It has also been suggested that the 11th General Meeting be held in the United Kingdom in 1972 on the occasion of the Challenger Centenary and the 2nd International Congress on the History of Oceanography (12-20 September 1972). It was agreed that Joint Oceanographic Assemblies should not be held more frequently than every six years. The following schedule of meetings for the next few years seems appropriate:

17-20 March 1970	London	14th Executive Meeting
13-25 September 1970	Tokyo	10th General Meeting
May 1971	?	15th Executive Meeting
January 1972	?	16th Executive Meeting
September 1972	United Kingdom	11th General Meeting.

6.2 JOINT OCEANOGRAPHIC ASSEMBLY

Following a recommendation of the 12th Executive Meeting, the President of SCOR and the Secretaries of IAPSO and IABO met with the Japanese Organizing Committee in Tokyo (28 March 1969). Agreement was reached on a preliminary program and schedule, and it was decided to establish an International Steering Committee with the following members:

G. Hempel (IABO), A.E. Maxwell (IAPSO), E.S.W. Simpson (CMG), M. Uda (Japanese Organizing Committee), W.S. Wooster (SCOR).

It was agreed that the First and Second Announcements should be prepared and printed by SCOR; the First Announcement was issued in April and the Second Announcement should be ready in December. The Japanese Organizing Committee will publish the program in June 1970.

Subsequently it was established that the General Assembly of IAPSO would be sponsored by the Science Council of Japan while meetings of the other organizations would be sponsored by the Oceanographical Society of Japan.

During the discussions of the Executive Committee, and subsequently with the officers of ACMRR, it was recognized that the financial requirements for the Assembly would be much greater than those now available to the participating organizations. It was hoped that governments and international organizations such as UNESCO, FAO and WMO would recognize the importance of these meetings and would make available the necessary funds. An appropriate resolution of the IOC VI Session would be helpful in this respect (such a resolution was adopted, as discussed in Annex VIII).

A list of future meetings of SCOR and associated organizations is given in Annex IX.

13TH SCOR EXECUTIVE MEETING

Göteborg, 26-28 August 1969

List of Participants

MEMBERS OF THE EXECUTIVE COMMITTEE

Professor Warren S. Wooster (USA)	President
Captain Luis R.A. Capurro (Argentina)	Retiring President
Professor Trygve Braarud (Norway)	Vice President
Dr. Klaus Voigt (Germany, GDR)	Secretary
Mr. Ronald I. Currie (IUBS/IABO)	Ex Officio
Dr. Thomas F. Gaskell (IUGS/CMG)	Ex Officio

OTHER PARTICIPANTS

Dr. George R. Deacon (SCOR Member from UK)
 Dr. Gunter Giermann (UNESCO/IOC)
 Mr. G.E. Hemmen (UK National Committee)
 Professor Gotthilf Hempel (IABO Secretary)
 Professor B. Kullenberg (SCOR Member from Sweden)
 Dr. Arthur E. Maxwell (IAPSO Secretary)
 Professor Rainer Radok (Australian National Committee)
 Professor J. Raymont (UK National Committee)

JOINT MEETING WITH ACMRR OFFICERS

Paris, 29 August 1969

Dr. C.E. Lucas (UK)	Chairman, ACMRR
Dr. W.M. Chapman (USA)	Vice Chairman, ACMRR
Dr. S. Tanaka (Japan)	Vice Chairman, ACMRR
Dr. Mario Ruivo (FAO)	Secretary, ACMRR
Dr. B. Diop (Senegal)	
Dr. S.J. Holt (FAO)	
Dr. J.L. McHugh (USA)	
Professor J.T. Ruud (Norway)	
Dr. M. Steyaert (UNESCO)	
Mr. G. Verploegh (WMO)	

Note: All participants in the Göteborg meeting, with the exception of Professors Kullenberg, Raymont and Radok, participated in the Paris meeting.

ESTIMATE OF SCOR FINANCES
(1 January thru 30 September 1969)

BALANCE as of 1 January 1969

In Rome	\$ 4,733.63 *
In La Jolla	<u>23,061.68</u>
	\$ 27,795.31

* 1,633.33 in Indian Rupees

INCOME

National Contributions	13,414.99	
UNESCO Contract	12,600.00	
Interest on Savings Account	<u>451.26</u>	<u>26,466.25</u>
		\$ 54,261.56

EXPENSES

Office	4,103.22
Publications	3,429.60
Working Groups (WG 10-\$1,248.50; WG 21-\$522.20; WG 23-\$1,058.45; WG 25-\$617.84; WG 28-\$890; WG 30-\$5,512.01; WG 31-\$1,277.50)	11,126.50
Executive Expense	10,512.04
Representatives, other meetings	1,908.00
UMC Symposium Support	1,500.00
Royal Society Symposium Support	400.00
ICES Symposium Support	<u>1,043.00</u>
TOTAL EXPENSES	\$ 34,022.36

BALANCE as of 30 September 1969

In Rome	\$ 5,133.63 *
In La Jolla	<u>15,105.57</u>
	<u>\$ 20,239.20</u>

* 2,133.63 in Indian Rupees

REPORT OF SCOR WORKING GROUP 21
ON
CONTINUOUS CURRENT VELOCITY MEASUREMENT
(with IAPSO and UNESCO)

REPORT OF MEETING IN DUBLIN, 25-27 SEPTEMBER 1969

SCOR Working Group 21, on Continuous Velocity Measurements, met several times during the ICES Symposium on Physical Variability in the North Atlantic, at Dublin during 25-27 September 1969. All the members of the group were present, except Dr. Shekhvatov who was at sea.

Dr. F. Webster was invited to take part in the meetings, and Dr. C.R. Mann was invited to discuss participation in a proposed further intercomparison experiment.

The Group considered the following items:

(1) The possibility of completing the intercomparison of current meters made in July 1967, by a further experiment involving Alekseev current meters.

(2) Whether, and in what form, current meter data should be submitted to data centers.

(3) The future of the working group.

The conclusions reached are set out below.

(1) Possibility of a further intercomparison experiment: The working group learned with great interest of the proposed expedition of the "Akademik Kurchatov" in early 1970, during which it is planned that a large number of Alekseev current meters will be moored in a small area in the trade-wind region of the Eastern North Atlantic. Dr. Chekotillo invited members of the working group to consider the possibility of participation in the expedition. It was unanimously agreed that this excellent opportunity for further intercomparison of current meters should not be missed.

The working group invites the approval of SCOR for the proposal outlined below, and if such approval is forthcoming requests that SCOR should communicate its approval to the USSR Academy of Sciences.

It is proposed that three of each of the following types of current meter should be provided for inclusion in the array of Alekseev meters, for comparison over a period of about two weeks:

Geodyne, Aanderaa, Plessey, Braincon.

(Note: (1) It is unlikely that the new Hydrowerkstatten meters will be available before May 1970

(2) The group wishes to propose including Braincon meters in view of their extensive use by the Bedford Institute, Canada.)

It is understood that it may be convenient for the "Akademik Kurchatov" to call at Southampton (UK) in mid-January 1970 to take equipment and visiting scientists on board, and might land the equipment there in April. It is proposed that the Geodyne and Braincon meters should be shipped to UK from Woods Hole and Bedford Institute. Aanderaa and Plessey meters, and possibly some Braincons, can be provided from UK sources.

Although all members of the group would have wished to take part if possible, other commitments prevent Mr. Kvinge and Drs. Siedler and Swallow from doing so. Drs. Fofonoff and Webster hope to be able to participate, and suggest that Mr. R. Heinmiller (WHOI) be invited as well. Mr. W.J. Gould (UK, NIO) and Dr. W. Zenk (FRG, Kiel) are willing to take part and would take care of the Aanderaa and Plessey meters. Dr. Mann was unable to accept personally an invitation to participate, due to another seagoing commitment, but suggested that Mr. C.K. Ross and possibly one other from the Bedford Institute, Canada, might be able to do so. It is proposed, therefore, that permission should be sought for the following six or seven visitors to join the "Akademik Kurchatov" at Southampton in mid-January 1970:

Dr. Fofonoff)	Mr. Gould	(NIO)
Dr. Webster) (WHOI)	Mr. Ross) (B.I.)
Mr. Heinmiller)	+ 1 other (?))
		Dr. Zenk	(Kiel)

It is understood that some of the moorings are to be set and recovered after a period of about ten days, and that Alekseev meters will be placed at approximately 12 levels from 25 to 300 meters. For the purpose of the intercomparison, and without detracting from the main experiment, it is desirable that the "visiting" current meters should be included in four moorings which are set and recovered after 14 days. It is recommended that the sampling interval should be 15 minutes. The "visiting" current meters should be paired with Alekseev meters at three depths, tentatively chosen as 25, 300 and 1000 meters, arranged in the following way:

Mooring no.:	1	2	3	4
Depth: 25m	G	P	B	A
300m	P	B	A	G
1000m	B	A	G	P

(G - Geodyne, P - Plessey, B - Braincon, A - Aanderaa)

Since the Alekseev meters are suspended from brackets clamped to a continuous wire mooring, and it is not the normal practice to cut the wire, it is proposed that bracket suspensions should be used for all the types of current meter. Dr. Chekotillo agreed to send a drawing of the existing brackets to those concerned so that suitable modified brackets can be constructed.

It is proposed that the six or seven visitors should leave at the first port after the 14-day moorings have been recovered, probably Dakar or Gibraltar in mid-February. It will be most convenient if the "visiting" equipment can be landed at Southampton during the return passage of the "Akademik Kurchatov" in April.

Original records or lists of data should be sent to Woods Hole for analysis not later than three months after the return of the "Akademik Kurchatov" in April 1970.

If SCOR decides to approve this proposal, the working group requests that SCOR consider providing support for the visiting scientists to travel to join and return from the ship, and for shipping current meters to and from Southampton.

Analysis of the data will take several months and it may be appropriate tentatively to plan for a further meeting of the group to consider the results in late 1971, perhaps in Moscow.

An alternative opportunity for an intercomparison occurs in mid-May to mid-June 1970, when the "Akademik Kurchatov" returns to continue work on the array of moorings. This would be a convenient opportunity for Dr. Siedler to provide three new Hydrowerkstatten meters, and it might be possible for Mr. Kvinge to join them, but it would be difficult for any Geodyne meters to be provided from Woods Hole or any equipment from the UK at that time. For most of the group, and considering the availability of equipment, the earlier opportunity would be much more convenient.

(2) Submission of Current Meter Data to Data Centers: The group discussed the question of whether raw or processed current meter data should be submitted for compilation in data centers. While recognizing the need for data centers to be able to meet requests from industrial and other users for information about currents, it was the opinion of the group that data centers should not store lists of raw current meter data. It was proposed that summaries of current information should be submitted. Such summaries might include the following, as a tentative minimum:

Position of observation; depth; depth of meter; type of meter; time of start of record; time of end of record; sampling interval; mean velocity (over whole period); mean velocity (per day or other interval); maximum velocity (over some period); minimum velocity (over some period); speed histogram; direction histogram; progressive vector diagram; location of data repository; data format.

(3) Future of the Working Group: If the proposed further intercomparison experiment is approved, it will be necessary for the group to continue its existence until the analysis of the results of that experiment is completed. SCOR is invited to consider the desirability of enlarging the group by including Dr. F. Webster and a representative from Canada (Bedford Institute) in view of their present and proposed future activities on its behalf.

ANNEX IV

REPORT OF SCOR WORKING GROUP 28 IAMAP/IAPSO/SCOR COMMITTEE ON AIR-SEA INTERACTION REPORT OF MEETING IN PRINCETON, NEW JERSEY, 21-23 JANUARY 1969

The Meeting was attended by the following:

K. Bryan, H. Charnock (Chairman), A.S. Monin, J. Namias, C.H.B. Priestley, R.W. Stewart, P. Welander, O.M. Ashford, V.A. Bugaev, J. Smagorinsky.

The report is extracted below. Apart from administrative matters, other items not reproduced here include a discussion of air-land interactions in relation to GARP.

6. Air-sea interaction in relation to ocean circulation studies

Some models of ocean circulation take the surface fluxes as given, though coupled atmosphere-ocean models have been studied. The main difficulty appears to lie in representing turbulent transport within the ocean.

More realistic representation of the near surface transport of heat, salt and momentum is hindered by our ignorance of the velocity structure of the upper layers of the ocean. Any method of observing the current distribution while avoiding the effects of waves would be of great interest.

The study of the response of the ocean to the atmospheric forcing, on all scales will be helped by the increased amount of data available but a corresponding increase in oceanic data is also needed if the full benefit is to be obtained.

7. Air-sea interaction in relation to GARP

There was a wide ranging discussion of this topic, it being realized that the planning for GARP was still in such a formative state that unequivocal answers to many questions could not yet be provided. Nevertheless there was a growing need to start the development of instruments so as to allow their field testing before the main GARP Global Experiment.

The basic assumption made was that GARP would seek a realistic mathematical model of the whole atmosphere and of the upper layers of the ocean, with an observational grid of about 500 km in the horizontal and with about 10 levels in the vertical.

(a) General policy on boundary layer incorporation

It will be essential to take into account the transfer of heat, water vapor and momentum by processes on too small a scale to be resolved by the observational network. The transfers with which the committee is concerned are most important in the layers near the surface.

A frequently occurring case is when the heat gained at the surface is fairly uniformly re-distributed through a boundary layer limited from above by a stable layer. In this case it may be possible to model the boundary layer using only the free atmospheric variables, provided by the model, and the sea surface temperature. The upper surface of the boundary layer would provide the bottom boundary of the model; its (variable) height and the implied vertical velocity could be specified by empirical means.

No experience has been gained using this explicit boundary layer formulation. It is at present only crudely developed but could possibly be refined to the extent that useful estimates of low cloud amounts would be possible.

Present large-scale models represent the boundary layer by specifying values of an exchange coefficient at various heights. Since the flux divergences are important at low levels this method requires that the lowest levels of the model be within the boundary layer, preferably within the surface (constant-flux) layer.

It may be possible to allow the exchange coefficients to vary not only with height but also with an appropriate stability parameter, itself determined by the variables (UVTr) of the model. In this case the methods are formally equivalent, if there is sufficient detailed computational resolution at many levels near the surface.

In both methods it is difficult to foresee the effects of motions on a scale greater than the height of the boundary layer but smaller than the grid size. Both also require a knowledge of the sea surface temperature.

(b) The treatment of mesoscale circulations

This is a general problem and we are concerned only with mesoscale circulations which affect the structure of the boundary layer. The difficulty is partly theoretical but more due to the lack of information as to the magnitude of the motions concerned and of their spatial correlation. In view of their importance to boundary layer structure and their relevance to the problem of the representation of volume averages by point observations the committee recommends that every effort be made to study their magnitude and their effects.

(c) Research needs

The need for study of mesoscale observations has already been stated.

The effective representation of boundary layer phenomena requires much more work on empirical methods for estimating turbulent transfer through a stratified atmosphere and on the mechanics of the boundary layer over the sea. Both theoretical and observational studies are needed.

The structure of the oceanic boundary layer is very badly known, especially the distribution of velocity in it. Any estimate of the distribution of turbulent fluxes in the upper layers of the ocean will be especially valuable not only for GARP but also for studies of the atmospheric circulation.

(d) Observational needs for initial conditions and for verification of long term model integrations

We take as an initial estimate that observations of UVTr will be needed, as initial conditions, at a spacing of about 500 km in the horizontal and at about 10 levels in the vertical. Since the initial conditions may include the time history of the observations, and for verification purposes, they will be taken twice daily for a period of a year or more.

Efforts are being made to extend the observational network to meet these requirements but difficulties are to be expected, especially in oceanic regions. We assume that a sufficient num-

ber of ocean weather ships, or large (manned or un-manned) buoys moored in the deep ocean, though desirable, will be prohibitively expensive. Tropospheric upper-air observations of UVTr can perhaps be made from merchant ships and supplemented in some areas by using large moored buoys (of the monster buoy type) as platforms for both sea-surface and upper-air observations. In this case every effort would be made to get detailed observations in the lower 150 mb and accurate observations of representative sea temperature, both at the sea surface and to a depth of at least 50 m.

The sea surface temperature would be known. For short period forecasts (up to 4 days) the climatological values can perhaps be taken. Three to seven day forecasts require recent observations to map any large (exceeding 0.5°C) sea surface temperature anomaly. Longer period forecasts will need a calculation of the temperature structure of the upper ocean, to an increasing depth as the period of the forecast increases.

Whether observations would be essential at a height below 10 m depends on the method adopted for the incorporation of the boundary layer. They would be more desirable if the model used had several levels within the boundary layer. Such observations are technically difficult but they would allow reasonably direct estimates of the initial surface fluxes (T_o , H_o , E_o). Their main purpose would probably be for verification. They could be used to check that the surface fluxes produced by a model were sufficiently realistic, both for climatological purposes and for studies of the ocean circulation.

At this stage it is impossible to foresee what the near surface observational need of GARP will be. Many combinations of methods, techniques and platforms are possible; nevertheless it seems prudent to investigate the potential performance and cost of some of those which seem likely to be useful.

The committee therefore recommends a design study of prototype buoys of the following kinds:

- (i) a simple, disposable drifting buoy which will observe and telemeter a near sea-surface temperature to an accuracy of $1/4^{\circ}\text{C}$ or better.
- (ii) a similar buoy with an added capability for observing and telemetering surface pressure, to 0.5 mb or better.
- (iii) a similar buoy which will observe and telemeter sea temperature at ten or more levels between the surface and, say, 50 m, with an accuracy of 0.1°C or better.
- (iv) a similar buoy to observe and transmit surface pressure (to .5 mb) as well as the sea temperature to 50 m (to 0.1°C).
- (v) a fixed or drifting buoy which would observe and transmit:
 - pressure to 0.5 mb.
 - sea temperature (surface to 50 m) to 0.1°C .
 - difference between sea temperature and air temperature (at a height between 2 and 10 m) to 0.5°C .
 - difference between sea temperature and wet bulb temperature (at a height between 2 and 10 m) to 0.5°C .
 - mean hourly wind speed (at a height between 2 and 10 m) to 1 m/sec or 10% of the wind speed.
 - wind direction (averaged over up to 1 hour) to 10° or 15° .

The capability of such a buoy for recording the duration of bright sunshine should be investigated, as should the possibility of monitoring some characteristics of rainfall.

It can be assumed that the signals will be transmitted via satellite and that drifting buoys will be located and their position relayed by satellite also. Some useful information on surface currents could be obtained from buoys with suitable sea anchors.

It would be an advantage if these buoys were sufficiently compact and robust to permit launching from aircraft. Their desirable life expectancy depends on their unit cost and the cost of launching; no detailed calculation has been made but a rough estimate is that they should survive for 100 days.

The committee recommends that the need for buoys of these types be made known to commercial firms, perhaps through a notice (from the JPS of the JOC for the GARP) in suitable journals such as Oceanology and Marine Technology. It will be clear that no firm estimate of the numbers which will be needed can be made at the present time, though a relatively small number will surely be useful for special projects.

9. Air-sea-land interactions

It was agreed that important processes of energy transfer took place in and over relatively narrow strips of ocean bordering land masses and often over the continental shelves.

The committee recommended that particular attention be paid to these areas, both theoretically and by observation, in the hope that they could be well represented in numerical models of the atmosphere and the ocean. This might need a reduction of the grid size in these areas since the processes were often intense but on a relatively small horizontal scale.

10. Air-surface interaction in relation to seasonal and long-term developments

It was appreciated that the increased density of observation associated with the GARP developments would provide a stimulating input to research on this aspect.

As these longer term developments would be difficult to simulate numerically the committee recommends that a group or groups be formed to study the incoming data, in real time, by existing empirical and statistical methods. Experience has shown the important role played by such groups in isolating and clarifying the new problems to which new sorts of data provide access.

It was assumed that attention would be paid to the archiving of the data so that it would be readily accessible to future workers. Correspondingly, in order to optimize the usefulness of past data, considerable weight should be given to the WMO Historical Sea Surface Temperature Project. The Committee was informed of this project, but its present status was not known.

12. The WWW and IGOSS network

The WMO representative gave a brief report of the increase in upper air observing stations. These included 100 more stations before 1971, mainly overland but some on small islands. Apart from some in Latin America most were in the Northern Hemisphere and it was felt that the provision of observation from the Southern Hemisphere would present grave problems.

Every effort was being made to install radio sonde and wind finding gear in merchant ships. The USSR was contemplating providing 3 ocean weather ships whose positions were not yet decided, though it was possible that one would be sited in the Atlantic, one in the Pacific and one in the Indian Ocean.

Little information was available about the IGOSS network. It was hoped that it would be integrated with that of WWW so far as was possible. Some of the possible IGOSS components might well be situated in places where air-sea-land interactions were of great importance.

SCOR WORKING GROUPS
MEMBERSHIP AND TERMS OF REFERENCE

WG 29. Continuous Monitoring in Biological Oceanography (with ACMRR, UNESCO and IBP/PM)

Terms of Reference: Using the outcome of various relevant working groups of SCOR and other organizations, to review critically the present status of devices for (a) continuous observation of parameters such as pigments, particles, transparency, submarine irradiance, primary production, nutrients, and (b) continuous or intermittent sampling of organisms, and to list suitable techniques and instruments for such measurements. The WG would work, where relevant, with the Chairman or Rapporteurs of other SCOR WG's.

Members: nominated by ACMRR: A. Longhurst, USA (Chairman); K. Grasshoff, FRG. nominated by IBP/PM: J.M. Colebrook, UK. nominated by UNESCO: C. Lorenzen, USA; K.W. Beklemishev, USSR. nominated by SCOR: G.L. Clarke, USA; R. LeBrasseur, Canada; S. Nishizawa, Japan.

WG 32. Biological Data Inventories (with ACMRR).

Terms of Reference: To review the present status of biological data inventories and information retrieval in national, regional and world data centers; to propose standard forms and procedures for inventory of marine biological and related biochemical data (exclusive of commercial fishery statistics); to review present procedures in cataloging reference collections of marine organisms; to consider means for speedy retrieval and exchange of information contained in such catalogs.

Members: nominated by ACMRR: S. Saila, USA; B. Zeitschel, FRG. nominated by SCOR: J.M. Colebrook, UK; G. Hempel, FRG (Chairman). ex officio: E. Akyuz (FAO); A.R. Picciolo (NODC); R. Serene (UNESCO); G.E. Watson (Smithsonian).

WG 33. Phytoplankton Methods (with IBP/PM).

Terms of Reference: To review the methods now used for quantitative phytoplankton studies (exclusive of pigment and other chemical methods); to select the most satisfactory methods for various purposes, such as the description of species composition of communities, studies for special components, and biomass estimation; for the selected methods, to recommend detailed procedures for sample collection, preservation and laboratory examination; to prepare a report that might serve as a basis for a manual, including references to literature on taxonomy of the main groups and on methods for using quantitative phytoplankton data in ecological studies.

Members: nominated by IBP/PM: G.A. Robinson, UK. nominated by SCOR: K. Banse, USA (Chairman); M. Bernhard, Italy; R.W. Eppley, USA; G. Hasle, Norway; R. Marumo, Japan; T. J. Smayda, USA; G.I. Semina, USSR.

OCEANOGRAPHIC RESEARCH REQUIRED FOR DEVELOPMENT OF IGOSS

The purpose of IGOSS is "to provide more extensive and timely information on, and prediction of, the state of the ocean and its interaction with the atmosphere, and to support research on the processes of the ocean, so that nations can provide improved oceanographic services to increase the safety and efficiency of their marine activities". It seems likely that in the eventual achievement of this purpose, autonomous telemetering buoys will play an important part. Much attention is being paid to the engineering development of such devices and to the technical and organizational problems of telecommunications, collection, exchange, distribution, data processing and product generation.

It is not obvious that equivalent attention is being given to obtaining the greater knowledge of ocean circulation and processes on which design and use of the system depends. Required oceanographic research includes the following:

1. Sampling - to attribute significance to a measurement, it is necessary to know the time and space variability of the parameter in question. Decisions on sampling frequency will also depend on the use to which the data will be put.
2. General Circulation Studies - a better understanding of ocean circulation is required to select the most sensitive and effective locations for monitoring.
3. Model Design - since a major goal of IGOSS is to improve forecasting of oceanic conditions, it is necessary to develop models which can provide the desired forecast, using the measured properties as inputs. The model will impose requirements on data collection.

The sampling problem will be reviewed by the IOC Group of Experts in Ocean Variability. The various IOC cooperative investigations will contribute to the general circulation studies in certain selected areas, but the programs were not designed nor the areas selected with the needs of IGOSS in mind. No IOC body is concerned with model design. Relevant SCOR groups to some aspects of these problems include WG 21 on Continuous Current Velocity Measurement, WG 27 on Deep Sea Tides, WG 28 on Air-Sea Interaction, and WG 29 on Continuous Monitoring in Biological Oceanography.

In considering the parallels with the World Weather Watch, it is noteworthy that the research effort required for design and use of that system has been singled out as the Global Atmospheric Research Program. GARP is being organized not uniquely by the World Meteorological Organization, but by a joint WMO/ICSU Organizing Committee.

If it is true that the underlying research aspects of IGOSS are not being adequately emphasized or pursued, it may be useful to identify this component as a specific cooperative research program with an appropriate title, such as Global Ocean Circulation Studies. Such a program is directly pertinent to the objectives of the International Decade of Ocean Exploration and the Expanded Program; the chapter on ocean circulation and ocean-atmosphere interactions of the report "Global Ocean Research" proposes a number of scientific projects specifically intended to contribute to the design of IGOSS.

If one pursues the WWW/GARP parallel a bit farther, one notes that it was the scientific community that took the initiative in stimulating development of the research program. This suggests that SCOR might bring together interested scientists and encourage cooperation among them in the development of a concerted attack on the problems of sampling, circulation and model design. If this action revealed the need for intergovernmental action to support the resulting research programs, the matter could then be placed before the IOC and its IGOSS Working Committee.

UNITED NATIONAL EDUCATIONAL
SCIENTIFIC AND CULTURAL ORGANIZATION

COMMENTS ON DEVELOPMENT OF THE EXPANDED PROGRAMME

Submitted by SCOR and ACMRR to IOC VI Session

At its meeting in June 1968, the IOC Bureau invited SCOR, ACMRR and other interested scientific bodies to give early consideration to the scientific content of an expanded programme of exploration of the oceans and their resources. This invitation led to the formation by SCOR, ACMRR and WMO of a Joint Working Party with the task of undertaking such consideration. In February 1969, the IOC Bureau formulated a set of questions for the guidance of the group which then met (29 April to 7 May 1969) in Ponza and Rome and produced the report "Global Ocean Research" (the so-called Ponza Report).

The IOC was asked by the United Nations General Assembly (in Resolution 2467D/XXIII) to cooperate with the Secretary-General in the preparation of "the comprehensive outline of the scope of the long-term programme of oceanographic research". To prepare a draft of this outline, an IOC Working Group met in June 1969, and after reviewing various national proposals, together with the Ponza report, compiled the document entitled "Draft Comprehensive Outline of the Scope of the Long-Term and Expanded Programme of Oceanic Exploration and Research".

The SCOR Executive Committee and the Bureau of ACMRR in a joint session (in August 1969) reviewed this draft and decided to transmit to the IOC VI Session the following views:

1. Studies proposed for inclusion in the Expanded Programme are of the following types: Exploration, mainly descriptive studies; analytical, interdisciplinary or specialized studies of oceanic processes; investigations of practical problems related to resource exploitation. All of these types of studies are essential to the purpose of the Expanded Programme, and none can be assigned general priority over another.
2. In practice, priorities will be established to accomplish scientific and economic objectives on the basis of available funds, facilities and personnel, and by the existence of circumstances where scientists and governments of a number of countries agree to work on a programme of common interest. The arbitrary assignment of priorities before these conditions are met may tend to discourage initiatives and interests that will arise in the course of the Expanded Programme. We consider it undesirable for IOC at this time to attempt to arrange a detailed list of programmes in order of priority.
3. Examples of the types of programmes relevant to the purposes of the Expanded Programme are described in the Ponza report, in the Draft Comprehensive Outline, and in the various national proposals. Attempts to perfect or to elaborate these documents would appear to serve little useful purpose at this stage.
4. Scientific programmes will in general be initiated by individual scientists and laboratories, while those in applied science, often with a high scientific content, may arise directly from governments in response to social and economic needs. Programmes of both types will be undertaken by individual laboratories, by groups of laboratories cooperating under informal arrangements, or by groups of national institutions collaborating on a regional basis, either governmental or non-governmental, or on a global basis through the IOC. In our opinion, the following principles should be applied to the development and implementation of programmes to be included within the Expanded Programme.

(a) Successful programmes of both types depend on the interest and involvement of scientists from the earliest stages of planning. Thus, IOC, in developing the Expanded Programme,

should encourage informal discussion among appropriate scientists, and the development of scientific bases and support for specific programmes before establishing such formal machinery as may be required for joint action.

(b) Successful cooperation in such programmes seems to depend on coordination being kept to the least formal level compatible with the complexity of the programme in question. Many components of the Expanded Programme will be most effectively coordinated at a bilateral or regional level and the IOC should take advantage of this. There will be some cooperative investigations that require intergovernmental coordination at the highest level, and these will be the appropriate subjects for the special attention and mechanisms of IOC. These will, of course, be in addition to the broader range of activities by which IOC facilitates the promotion of marine science.

5. We recognize the necessity for IOC to respond to the invitation to cooperate with the United Nations Secretary-General in the preparation of a comprehensive outline of the scope of the Expanded Programme. In our opinion, the scope is well described in the Ponza Report, and particularly in the answers to the questions of the IOC Bureau as set forth in the summary of that report. From this point of view, a useful contribution to the Secretary-General's task would be a brief general statement based on that summary, on the introduction and part II of the Draft Comprehensive Outline and on the concepts contained in the present statement. The IOC report to the Secretary-General should include the Ponza Report, the Draft Comprehensive Outline and national proposals as sources of further information on the nature of possible programmes.

6. Meanwhile SCOR and ACMRR, in cooperation with other appropriate bodies, are prepared to assist in translating the general concept and scope of the Expanded Programme into specific research programmes. To this end, scientific discussions on a number of relevant topics have already been initiated.

ANNEX VIII

ANALYSIS OF IOC VI SESSION RESOLUTIONS

During the IOC VI Session (Paris, 2-13 September 1969), a number of resolutions of interest to SCOR Members and National Committees were adopted. An annotated list of the resolutions follows:

VI-1 Adoption of the Comprehensive Outline of the Scope of the Long-Term and Expanded Programme of Oceanic Exploration and Research

After recognizing the purpose of the Expanded Program as

"to increase knowledge of the ocean, its contents and the contents of its subsoil, and its interfaces with the land, the atmosphere, and the ocean floor and to improve understanding of processes operating in or affecting the marine environment, with the goal of enhanced utilization of the ocean and its resources for the benefit of mankind",

the resolution approves the Comprehensive Outline as the basis for the further development of that program and instructs the Chairman to transmit the Outline to the UN Secretary-General. The Bureau and Consultative Council, with the assistance of the Group of Experts on Long-Term Scientific Policy and Planning (see VI-2), and in cooperation with interested international organizations and the Commission's advisory bodies, is to develop fully the program and initiate its implementation. Appropriate UN organization and Member States of the UN system are requested to support the program.

VI-2 Implementation of the Long-Term and Expanded Program

In order to enlarge the scope of scientific advice to IOC, an appropriate WMO scientific advisory body, after it has been established, is to be accepted as an advisory body to the Commission. The Bureau is to establish a Group of Experts on Long-Term Scientific Policy and Planning, to keep under continuing review the Expanded Program and to advise on its implementation. Terms of reference for the group are given, and the Bureau and Consultative Council is to decide on principles regarding the composition and selection of the Group.

VI-3 IOC Statutes and Rules of Procedure

Revised Statutes were approved and recommended to the 16th General Conference of UNESCO for adoption. Changes in the revised draft include a more detailed statement of the functions of the Commission, transformation of the Bureau and Consultative Council into an Executive Council, and clarification of the opportunities for joint action by IOC and UN organizations in addition to UNESCO. An ad hoc working group of governmental experts is set up to draft new Rules of Procedure.

VI-4 Planning of the Commission's Activities for 1971-1972

An appropriate level of support and staffing is proposed, the Bureau and Consultative Council are directed to examine program and budget and take appropriate steps at each session, and UN organizations cooperating through the Inter-Secretariat Committee on Scientific Programs are asked to include the necessary support for IOC in their budgets.

VI-5 UNESCO Program in Oceanography 1971-1972

An appropriate level of support and staffing is proposed.

VI-6 IOC Fund-in-Trust

The UNESCO Director-General is invited to establish a fund-in-trust, and member countries are invited to contribute.

VI-7 Adoption of the General Plan and Implementation Program of IGOSS for Phase I

The general Plan, as prepared by the IGOSS Working Committee, is adopted, and organizations and Members are called upon for support. Further planning is proposed, and the need is recognized for more detailed studies on the requirements of oceanography regarding the location of observing stations and of parameters to be observed, including their accuracy and the requirements of users of the oceans for oceanic environmental information.

VI-8 Cooperative Study of the Kuroshio and Adjacent Regions

A survey of the South China Sea is recommended during 1970-1972, to be followed by a year of data analysis and a symposium on CSK in 1973, after which future CSK activities can be decided. Participation and support of organizations and countries is invited.

VI-9 Cooperative Investigations of the Caribbean and Adjacent Regions

The next meeting of the Coordination Group is to be held in Mexico in early 1970, and Mexico is requested to establish a sorting center for the program. NODC (USA) is to serve as the Regional Data Center for CICAR, and an Operations Center is to be established in Curacao. UNESCO is requested to provide certain equipment and shipboard fellowships, to assist the sorting center and the publication of the CICAR newsletter, collected reprints and atlases. WMO is to be invited to appoint a subject leader for meteorological aspects, and FAO to continue to assist

in the fishery aspects.

VI-10 International Coordination Group for the Southern Ocean

The Secretary is to initiate work by correspondence and to arrange for an early meeting of the group, SCAR being requested to assist in preparing advance documentation. The Group is invited to take notice of the proceedings and recommendations of the SCAR/SCOR/IAPSO Symposium on Antarctic Oceanography (Santiago, 1966).

VI-11 Cooperative Systematic Studies in the North Atlantic

The tasks listed in Resolution V-13 should be undertaken as a matter of urgency, and various proposals for cooperative programs in the North Atlantic should be considered for incorporation in the Expanded Program.

VI-12 Cooperative Investigations of the Northern Part of the Eastern Central Atlantic (CINECA)

This is adopted in principle as a cooperative program of the Commission, to be implemented by ICES. A more detailed study of the proposal is to be made by an ad hoc planning group established by ICES and CECAP. SCOR is requested to study and comment on the proposals with a view to widening the scientific scope of the study, and WMO is invited to give support.

VI-13 Promoting Fundamental Scientific Research

The Commission should assist in promoting fundamental scientific research carried out either in the framework of the Expanded Program or within Declared National Programs, subject to certain principles: early notification to the coastal state so that it may be associated with planning; early submission of a formal description of the nature and location of the research program to the coastal state and IOC, to provide time for a formal response from the coastal state and for their effective participation; transmittal by the IOC Secretary of the formal description within twenty days of receipt with the Commission's request for favorable consideration, and with a factual description of the international scientific interest in the subject prepared by the requesting state, supplemented, if he considers this desirable, by the Secretary; the coastal State can participate in such research; the coastal State will have available as soon as possible all resulting data, including data and samples not feasible to duplicate, for which special arrangements will be made; the results of such research programs are to be published as soon as possible in an open internationally distributed scientific publication. Members are invited to cooperate and the working group is asked to continue to examine the question.

VI-14 Legal Status of Ocean Data Acquisition Systems (ODAS)

The Group of Experts on the Legal Status of ODAS, with suitably broadened membership, is requested to prepare a preliminary draft convention on the legal status of ODAS by early 1970, prior to a preparatory conference of governmental experts to be convened by UNESCO, and a subsequent international conference of states. The continuing participation of IMCO in this work is invited.

VI-15 Subsidiary Bodies of the Commission

The Commission, after taking note of the reports of a number of its subsidiary bodies, dissolved the Working Group on Marine Pollution, the Special Working Group on the Long-Term and Expanded Programme and the Ad Hoc Group of Governmental Experts on Statutory Implications of Further Development of the IOC, requests the Bureau and Consultative Council to review and present such reports to the Commission and to look into all administrative and inter-organizational problems related to its work, and requests the Chairman to submit to the next Session a full proposal concerning a new rationalized system of the Commission's subsidiary bodies.

VI-16 Marine Pollution

The Commission recognizes that a Joint IMCO/FAO/UNESCO/WMO Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) has been established, thus making the pertinent IOC group no longer necessary. Steps are proposed whereby GESAMP can provide advice to IOC.

VI-17 Training and Education in Marine Science

After noting activities in this field, including the establishment by UNESCO of a post for a Training and Education Officer in the Office of Oceanography, the Commission considers that there is still need for new additional arrangements to be made directly through the Commission. The Secretary is instructed to discuss the improvement of present arrangements with a number of organizations, to explore the possibilities of maintaining an up-to-date information file on training opportunities, and to arrange a further meeting of the IOC Working Group on Training and Education, if possible in conjunction with the Working Group on Mutual Assistance.

VI-18 Bathymetric Data

The IHB is invited to continue its work on the General Bathymetric Chart of the Oceans. The Commission acknowledges the intention of IHB to publish annually an inventory of information on survey work, and requests members and interested organizations to cooperate fully in the work of IHB.

VI-19 Bruun Memorial Lecture

In future Sessions, there are to be three Bruun Memorial Lectures, summarizing important developments in the fields of solid earth studies, physical and chemical oceanography and meteorology, and marine biology. The advisory bodies are to assist the Bureau and Secretary in selecting appropriate speakers, and UNESCO is requested to arrange for publication of these lectures on a regular basis.

VI-20 Ocean Engineering

The Commission notes the possibility that an Engineering Committee on Oceanic Resources may be established, encourages the formation of such a committee, and looks forward to the possibility that it can advise the Commission on matters of interest.

VI-21 Joint Oceanographic Assembly (Tokyo, Japan - September 1970)

The Commission applauds the initiative of the scientific organizations and the hospitality of Japan in proceeding with arrangements for this meeting, considers the Assembly as a desirable approach to the organization of world oceanographic meetings of broad scope, and urges members and international organizations to provide the necessary financial support for the organization and implementation of the Assembly and for the participation of interested scientists.

VI-22 Expression of Appreciation

Appreciation is extended to Dr. Fedorov, retiring Secretary of the Commission.

MEETINGS OF SCOR AND ASSOCIATED ORGANIZATIONS
IN 1970

19 - 24 January	Paris	IOC <u>Ad Hoc</u> Group of Governmental Experts to draft new Rules of Procedure, 1st Meeting.
26 - 31 January	Paris	IOC Bureau and Consultative Council, 11th Meeting.
16 - 20 February	New York	IOC Working Group on Legal Questions related to Scientific Investigations in the Ocean, 2nd Meeting.
? February	Mexico	IOC International Coordination Group for CICAR, 3rd Meeting.
2 - 6 March	Paris	IMCO/FAO/UNESCO/WMO Group of Experts on the Scientific Aspects of Marine Pollution, 2nd Meeting.
17 - 20 March	London	SCOR Executive Committee, 14th Meeting.
23 - 27 March	Cambridge	SCOR Symposium on Geology of the East Atlantic Continental Margin.
? April	Brussels	IOC International Coordination Group for the Southern Ocean, 1st Meeting.
? April	Rome	IOC International Group for the Scientific Coordination of the Cooperative Investigations in the Mediterranean.
27 April - 6 May	Geneva	WMO/IOC Group of Experts on Telecommunication, 3rd Meeting.
? May	Paris	IOC Group of Experts on Ocean Variability, 2nd Meeting.
? May	?	IOC International Coordination Group on the Tsunami Warning System in the Pacific
? June	Geneva	WMO/IOC Group of Experts on Coordination of Requirements, 3rd Meeting.
15 - 26 June	London	IOC Group of Experts on Legal Status of ODAS, 4th Meeting.

?	June	Rome	IOC Group of Experts on the Long-Term Scientific Policy and Planning, 1st Meeting.
?	July	?	IOC Working Group on Mutual Assistance, with IOC Working Group on Training and Education.
13 - 25	September	Tokyo	SCOR/IAPSO/IABO/CMG Joint Oceanographic Assembly; SCOR 10th General Meeting.
22 - 25	September	Geneva	IOC Working Group on Oceanographic Data Exchange, 5th Meeting.
?	September	Tokyo	IOC International Coordination Group for CSK, 7th Meeting; 2nd CSK Symposium.
?	October	Copenhagen	ICES 58th Statutory Meeting.
?	November	Paris	IOC Bureau and Consultative Council, 12th Meeting.
?	November	Geneva	IOC Working Committee for IGOSS and WMO EC Panel on Meteorological Aspects of IGOSS.
9 - 18	December	Rome	FAO Technical Conference on Marine Pollution and its Effects on Living Resources and Fishing.

ABBREVIATIONS

ACMRR	Advisory Committee on Marine Resources Research (of FAO)
BI	Bedford Institute, Nova Scotia, Canada
CECAF	Fishery Committee for the Eastern Central Atlantic (of FAO)
CICAR	Cooperative Investigations of the Caribbean and Adjacent Regions
CINECA	Cooperative Investigations of the Northern Part of the Eastern Central Atlantic
CMG	Commission on Marine Geology (of IUGS)
CSK	Cooperative Study of the Kuroshio
EC	Executive Committee (of WMO)
ESSA	Environmental Science Services Administration (USA)
FAO	Food and Agriculture Organization of the United Nations
FRG	Federal Republic of Germany
GARP	Global Atmospheric Research Program (of WMO/ICSU)
GDR	German Democratic Republic
GESAMP	Group of Experts on the Scientific Aspects of Marine Pollution
IABO	International Association of Biological Oceanography (of IUGS)
IAMAP	International Association of Meteorology and Atmospheric Physics (of IUGG)
IAPSO	International Association for the Physical Sciences of the Ocean (of IUGG)
IBP/PM	International Biological Programme/Productivity Marine
ICES	International Council for the Exploration of the Sea
ICSU	International Council of Scientific Unions
IGOSS	Integrated Global Ocean Station System (of IOC)
IGU	International Geographical Union
IHB	International Hydrographic Bureau
IIOE	International Indian Ocean Expedition
IMCO	Intergovernmental Maritime Consultative Organization
IOBC	Indian Ocean Biological Center
IOC	Intergovernmental Oceanographic Commission
IUB	International Union of Biochemistry
IUBS	International Union of Biological Sciences
IUGG	International Union of Geodesy and Geophysics
IUGS	International Union of Geological Sciences
IUPAP	International Union of Pure and Applied Physics
IUPS	International Union of Physiological Sciences
JOC	Joint Organizing Committee (of GARP)
JPS	Joint Planning Staff (of JOC)
NIO	National Institute of Oceanography, Surrey, England
NODC	National Oceanographic Data Center, Washington, D.C.
ODAS	Ocean Data Acquisition Systems
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
SIO	Scripps Institution of Oceanography, La Jolla, California
UAR	United Arab Republic
UMC	Upper Mantle Committee
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
WG	Working Group
WHOI	Woods Hole Oceanographic Institution, Woods Hole, Massachusetts
WMO	World Meteorological Organization
WWW	World Weather Watch (of WMO)